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PRELIMINARY DRAFT ENVIRONMENTAL STATEMENT

# PROPOSED LIVESTOCK GRAZING PROGRAM CERBAT/BLACK MOUNTAIN PLANNING UNITS

MOHAVE COUNTY ARIZONA

## VOLUME ONE
## ENVIRONMENTAL ANALYSIS

PHOENIX DISTRICT, ARIZONA STATE OFFICE
BUREAU OF LAND MANAGEMENT
DEPARTMENT OF THE INTERIOR

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# CERBAT/BLACK MOUNTAIN PLANNING UNITS

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**VOLUME ONE**
**ENVIRONMENTAL ANALYSIS**

November 22, 1977

PHOENIX DISTRICT, ARIZONA STATE OFFICE
BUREAU OF LAND MANAGEMENT
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# I. DESCRIPTION OF THE PROPOSED PROJECT*

## A. PURPOSE AND SCOPE

The purpose of this Environmental Statement (ES) is to disclose to the public and public land managers in advance, the probable environmental and socioeconomic impacts of implementation of 26 allotment management plans (AMPs) for intensive livestock grazing management and of custodial management of eight areas (allotments) in the Cerbat and Black Mountain Planning Units in northwest Arizona (Figure I-1).

Table I-1 illustrates land ownership within the planning units. Of the 1,600,892 acres of public land within the planning area, 1,445,652 acres are included as part of the proposed livestock grazing program. The remaining 155,240 acres are excluded from the proposed action since the area has been reserved for wildlife and wild burros pursuant to the Taylor Grazing Act and Title 43 of the Code of Federal Regulations (CFR) 4111.3-1(b).

Implementation of the proposed action would result in an average initial reduction of livestock grazing use by 21%.

## B. BACKGROUND

In October 1973, the Natural Resource Defense Council (NRDC) and other environmental organizations filed a lawsuit in the Federal District Court for the District of Columbia contending that:

1. The Bureau of Land Management (BLM) had violated and was violating the National Environmental Policy Act (NEPA) by continuing to authorize livestock grazing on public land without preparing and circulating the necessary environmental impact statements.

2. The programmatic ES prepared by the BLM was not adequate in that it did not consider the specific environmental effects of any individual actions in particular areas.

On December 30, 1974, the court ruled in favor of the plaintiffs and ordered the defendants to work out an agreement with the NRDC to accomplish the required environmental statement.

The agreement requires BLM to complete 212 site-specific ESs on its grazing program. Fifteen of these apply to Arizona, 11 of them to the Phoenix District. This ES for the Cerbat and Black Mountain Planning Units is the first to be undertaken in the Phoenix District and was so chosen primarily because the District's multiple-use planning had been completed. The management framework plan (MFP) for the Cerbat unit was completed in 1974, and that for the Black Mountain unit in 1975.

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*References for this chapter follow on page I-47.

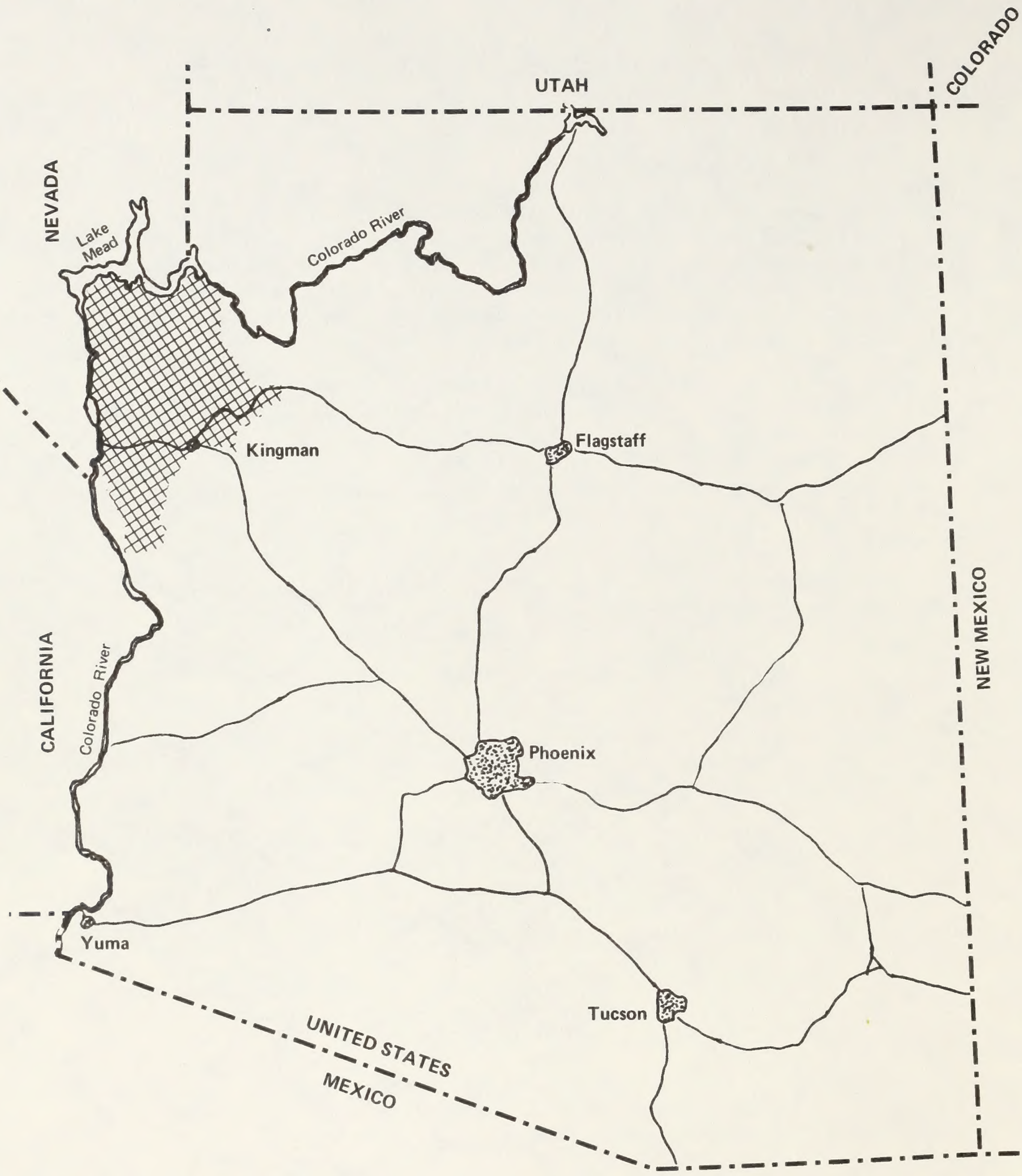


FIGURE I-1 ES STUDY AREA LOCATION

TABLE I-1

ACREAGE AND LAND OWNERSHIP IN CERBAT/BLACK MOUNTAIN ES AREA

| Proposed Action | Public Land | Controlled Land[a] | Uncontrolled Land[b] | Grand Total |
|---|---|---|---|---|
| Intensive Management (26 AMPs) | | | | |
| Grazing Systems | 710,639[c] | 205,224 | 230,716 | |
| Custodial | 70,793 | 81,459 | 55,286 | |
| Ephemeral | 635,196[d] | 19,695 | 52,653 | |
| Subtotal | 1,416,628 | 306,378 | 338,655 | |
| Custodial Management (8 allotments) | | | | |
| Custodial (100% license)[e] | 9,410 | 111,136 | - | |
| Custodial (percent of use license)[f] | 19,614 | 25,089 | 15,336 | |
| Subtotal | 29,024 | 136,225 | 353,991 | |
| Total for Proposed Action | 1,445,652 | 442,603 | 353,991 | 2,242,246 |

| Area Reserved for Wildlife (not part of proposed action) | Public Land | Private Land | Grand Total |
|---|---|---|---|
| Warm Springs-Black Mountain Unit | 81,860 | 20,100 | |
| Boundary Cone-McHeffy Butte Unit | 73,380 | 3,300 | |
| Total Reserved for Wildife | 155,240 | 23,400 | |
| Total for ES Area | 1,600,892 | 819,994 | 2,420,886 |

a. Private and state-owned lands controlled by an allottee.
b. Private and state-owned lands not controlled by an allottee.
c. Includes 23,229 acres in Lake Mead National Recreation Area
d. Includes 383,866 acres in Lake Mead National Recreation Area
e. BLM does not control livestock numbers.
f. BLM does control livestock numbers.

Source: Bureau of Land Management.

Before completion of the MFPs, intensive management through AMPs was applied to three allotments (Music Mountain, Crozier Canyon, and Upper Music) in the Cerbat/Black Mountain ES area. Although the AMPs were prepared before the completion of the MFPs, their provisions do not conflict with MFP decisions. (The relationship betweel MFPs and AMPs is further discussed in Section D, Interrelationships.)

The MFP provides for intensive livestock grazing management practices through AMPs and custodial management, the proposed action of this ES. Custodial management is proposed exclusively for eight allotments, and on portions of seven other allotments. The remainder of these seven allotments, and 19 other allotment areas are managed intensively through AMPs.

The intensive livestock management areas (AMPs) are identified in Figure I-2.* The custodial allotments are identified and discussed in Section C-2 below.

## C. SPECIFICS OF THE PROPOSED ACTION

### 1. Intensive Livestock Grazing Management

#### a. Allotment Management Plans

The AMPs integrate livestock grazing with other land uses. Each plan describes the allotment area, establishes resource objectives, and prescribes a grazing system to meet those objectives. The AMP identifies the range improvements needed to implement the grazing system and also details the procedures used to evaluate progress toward accomplishing the management objectives. The 26 AMPs are available for review in the Phoenix District and Kingman Resource Area offices.

The AMPs for the Cerbat and Black Mountain Planning Units include the following components:

(1) General Information. Includes a general description of the location and size of the allotment, and a base map (usually made from 7.5-foot U.S. Geological Survey [USGS] topographic maps) with overlays showing the land ownership status, existing and proposed range improvements, pastures, MFP multiple-use decisions, range types, range condition, location of range survey transects, and locations for evaluation studies. Table I-2 summarizes land ownership for each AMP.

(2) Resource Data. Includes a description of the topography, climate, soils, erosion condition, vegetation, grazing capacity, range condition and trend, existing range improvements, water resources, and wildlife populations.

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*Figure I-2 will be found in the "pocket" at the end of this volume.

TABLE I-2

ACREAGE SUMMARY OF LAND OWNERSHIP BY AMP

| Allotment | Public Land: Grazing Systems | Public Land: Custodial | Public Land: Ephemeral[b] | Public Land: Total Public | Controlled Land[a]: Grazing Systems | Controlled Land[a]: Custodial | Controlled Land[a]: Ephemeral[b] | Controlled Land[a]: Total Controlled | Uncontrolled Land[a]: Grazing Systems | Uncontrolled Land[a]: Custodial | Uncontrolled Land[a]: Ephemeral[b] | Uncontrolled Land[a]: Total Uncontrolled | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Big Ranch | 109,537 | | 124,918<br>288,329[c] | 522,784 | 8,134 | | 10,691 | 18,825 | 54,996 | | 18,793 | 73,789 | 615,398 |
| Black Mountain | 56,390 | 13,852 | | 70,242 | 2,900 | 19,714 | | 22,614 | 5,304 | 19,674 | | 24,978 | 117,834 |
| Cane Springs | 26,344 | 23,917 | | 50,261 | 27,017 | 16,878 | | 43,895 | 5,766 | 6,544 | | 12,310 | 106,466 |
| Canyon Ranch | 17,251 | 320 | | 17,571 | 2,235 | 14,907 | | 17,142 | 8,960 | 14,127 | | 23,087 | 57,800 |
| Castle Rock | 5,249 | | | 5,249 | 600 | 2,038 | | 2,638 | 1,040 | 1,936 | | 2,976 | 10,863 |
| Cedar Canyon | 19,232 | 24,568 | | 43,800 | 19,026 | 24,595 | | 43,621 | 38 | 784 | | 822 | 88,243 |
| Cerbat/Quail Springs/ Turkey Track | 49,705 | | | 49,705 | 7,232 | | | 7,232 | 12,628 | | | 12,628 | 69,565 |
| Clay Springs | 6,336 | | | 6,336 | 6,117 | | | 6,117 | 432 | | | 432 | 12,885 |
| Crozier Canyon | 81,844 | | | 81,844 | 30,979 | | | 30,979 | 1,793 | | | 1,793 | 114,616 |
| Curtain | 3,670 | | | 3,670 | | | | | | | | | 3,670 |
| Diamond Bar/ Gold Basin | 82,056<br>23,229 | | 49,400[c] | 154,685 | 55,998 | | | 55,998 | 36,028 | | 310 | 36,338 | 247,021 |
| Dolan Springs | 37,025 | | | 37,025 | 3,730 | | | 3,730 | 32,286 | | | 32,286 | 73,041 |
| Ft. McEwen | 26,284 | 8,136 | 31,174<br>9,679[c] | 75,273 | 8,228 | 3,327 | 445 | 12,000 | 2,966 | 12,221 | 3,388 | 18,575 | 105,848 |
| Gediondia | 13,643 | | | 13,643 | 1,048 | | | 1,048 | 6,188 | | | 6,188 | 20,879 |
| Hackberry | 32,067 | | | 32,067 | 14,921 | | | 14,921 | 22,608 | | | 22,608 | 69,596 |
| Mineral Park | 11,449 | | | 11,449 | 2,465 | | | 2,465 | 4,117 | | | 4,117 | 18,031 |
| Mt. Tipton | 5,817 | | | 5,817 | 4,823 | | | 4,823 | 3,646 | | | 3,646 | 14,286 |
| Mud Springs | 32,179 | | | 32,179 | 5,273 | | | 5,273 | 16,218 | | | 16,218 | 53,670 |
| Music Mountain | 18,116 | | | 18,116 | 1,043 | | | 1,043 | 1,046 | | | 1,046 | 20,205 |
| Pine Springs | 6,783 | | | 6,783 | 20 | | | 20 | 1,172 | | | 1,172 | 7,975 |
| Portland Spring | | | 8,724<br>30,360[c] | 39,084 | | | | | | | 2,471 | 2,471 | 41,555 |
| Silver Creek | | | 67,154 | 67,154 | | | 3,764 | 3,764 | | | 21,589 | 21,589 | 92,507 |
| Stockton Hill | 3,015 | | | 3,015 | 5 | | | 5 | 912 | | | 912 | 3,932 |
| Thumb Butte | | | 16,677<br>2,683[d]<br>6,098[c,d] | 25,458 | | | 4,795[d] | 4,795 | | | 1,471<br>4,631[d] | 6,102 | 36,355 |
| Truxton Canyon | 5,652 | | | 5,652 | 2,280 | | | 2,280 | 4,734 | | | 4,734 | 12,666 |
| Upper Music | 37,766 | | | 37,766 | 1,150 | | | 1,150 | 7,838 | | | 7,838 | 46,754 |
| Total | 710,639 | 70,793 | 635,196 | 1,416,628 | 205,224 | 81,459 | 19,695 | 306,378 | 230,716 | 55,286 | 52,653 | 338,655 | 2,061,661 |

a. Controlled and uncontrolled are comprised of private and state-owned lands.
b. Ephemeral refers to acreage dominated by growth of annual vegetation.
c. Included within the Lake Mead National Recreation Area.
d. Custodial lands within ephemeral allotment.

**Source**: Bureau of Land Management.

(3) Present Management. Describes the present grazing management practices and provides livestock data (numbers, percent, calf crop, weaning weights, etc.).

(4) Special Management Problems. Discusses any special problems unique to the allotment.

(5) Analysis of Other Land Use Needs. Defines other land use needs and identifies any constraints imposed on livestock grazing. The section includes a discussion of wildlife, watershed protection, recreation, rights-of-way or other realty actions, mining, vegetative products, and wild horse and burro considerations which apply to the specific allotment or between adjacent allotments. Also included is information pertaining to agreements with other governmental agencies or private parties.

(6) Objectives. States general multiple-use objectives and specific vegetative and livestock objectives compatible with MFP decisions, and estimates the length of time required to attain the objectives.

General multiple-use objectives for the AMPs for the Cerbat/Black Mountain planning units are:

- Improve wildlife habitat by providing more forage, cover, and water; and reduce competition between wildlife and livestock by periodically excluding livestock from pastures.

- Reduce soil erosion and increase water infiltration by increasing vegetative ground cover and litter.

- Enhance recreational values by increasing the abundance and vigor of vegetation, thereby reducing dust and erosion, and by increasing the potential for wildlife observation and study.

- Sustain livestock production by providing more and better quality forage.

To realize the general multiple-use objectives, specific objectives relating to vegetation have been established and key areas for evaluating the success of the management program have been selected. The goals contained in each AMP specify the present and desired percentage composition of various plants and the present and desired percentage of vegetative ground cover. The desired species composition and ground cover are based on the estimated potential for that particular range site, determined through comparison with similar areas in good condition (e.g., comparison of fence line construction and data from exclosures).

Past overgrazing and the unreliability and scarcity of rainfall generally retard vegetative recovery in the desert. Several cycles of a grazing system and several years of favorable precipitation may be necessary to evaluate the success or failure of a particular management plan.

Table I-3 summarizes some of the more specific management objectives for each allotment.

(7) Grazing Management. Establishes the initial stocking level, prescribes a grazing system, specifies the range improvements necessary for implementation of the grazing system, and provides for flexibility, evaluation, and modification.

- Stocking Levels

Stocking levels were determined in 1958, 1976, and 1977 from grazing capacity estimates calculated using the ocular reconnaissance range survey method (BLM Manual 4412.11A) and from an extensive survey using pace-point transects within very broad vegetative communities. The vegetative composition and density from the pace-point transect were converted directly to the ocular reconnaissance-type writeup sheets to estimate grazing capacity in the extensive survey.

The following 19 allotment areas were intensively surveyed in 1976 and 1977 using the ocular reconnaissance method:

Big Ranch*
Cane Springs
Canyon Ranch
Castle Rock
Cedar Canyon
Cerbat/Quail Springs/Turkey Track
Clay Springs
Curtain
Diamond Bar/Gold Basin*
Dolan Springs
Gediondia
Mineral Park
Mt. Tipton
Mud Springs
Music Mountain
Pine Springs
Truxton Canyon
Upper Music
Stockton Hill

*The portions of these allotments designated as ephemeral range were not surveyed.

## TABLE I-3

## SUMMARY OF MANAGEMENT OBJECTIVES FOR AMPS

| Type of Grazing System and Allotment | Allotment Number | Wildlife Habitat Forage Reservation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Deer | | | | Bighorn Sheep | | | | Pronghorn | | | |
| | | Present Population | | Objective | | Present Population | | Objective | | Present Population | | Objective | |
| | | No. | AUMs | No. | AUMs | No. | AUMs | No. | AUMs | No. | AUMs | No. | AUMs |
| Santa Rita | | | | | | | | | | | | | |
| Big Ranch | 7A | 28 | 84 | 31 | 93 | 247 | 988 | 284 | 1,136 | 0 | 0 | 0 | 0 |
| Black Mountain | 10A | 29 | 87 | 32 | 96 | 18 | 72 | 22 | 88 | 0 | 0 | 0 | 0 |
| Cane Springs | 15A | 109 | 327 | 141 | 423 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Castle Rock | 18A | 8 | 24 | 12 | 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cerbat/Quail Springs/Turkey Track | 20A | 67 | 201 | 77 | 231 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dolan Springs | 30A | 32 | 96 | 37 | 111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ft. McEwen | 34A | 19 | 57 | 29 | 87 | 32 | 128 | 38 | 152 | 0 | 0 | 0 | 0 |
| Mineral Park | 55A | 19 | 57 | 25 | 75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mt. Tipton | 58A | 28 | 84 | 34 | 102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pine Springs | 60A | 3 | 9 | 6 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stockton Hill | 66A | 9 | 27 | 11 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Three-pasture Rest Rotation | | | | | | | | | | | | | |
| Canyon Ranch | 17A | 55 | 165 | 75 | 225 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diamond Bar/Gold Basin | 29A | 183 | 549 | 249 | 747 | 161 | 644 | 185 | 740 | 0 | 0 | 0 | 0 |
| Four-pasture Rest Rotation | | | | | | | | | | | | | |
| Upper Music Mountains | 71A | 34 | 102 | 50 | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Deferred Grazing | | | | | | | | | | | | | |
| Cedar Canyon | 19A | 43 | 129 | 53 | 159 | 0 | 0 | 0 | 0 | 6 | 12 | 6 | 12 |
| Clay Springs | 23A | 24 | 72 | 36 | 108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crozier Canyon | 26A | 199 | 597 | 215 | 645 | 0 | 0 | 0 | 0 | 40 | 80 | 50 | 100 |
| Curtain | 27A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gediondia | 36A | 7 | 21 | 8 | 24 | 22 | 88 | 26 | 104 | 0 | 0 | 0 | 0 |
| Hackberry | 42A | 75 | 225 | 84 | 252 | 0 | 0 | 0 | 0 | 18 | 36 | 22 | 44 |
| Mud Springs | 56A | 7 | 21 | 8 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Music Mountain | 57A | 19 | 57 | 28 | 84 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Truxton Canyon | 70A | 28 | 84 | 35 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeral | | | | | | | | | | | | | |
| Portland Spring | 61A | 4 | 12 | 5 | 15 | 4 | 16 | 13 | 52 | 0 | 0 | 0 | 0 |
| Silver Creek | 65A | 11 | 33 | 12 | 36 | 12 | 48 | 14 | 56 | 0 | 0 | 0 | 0 |
| Thumb Butte | 68A | 7 | 21 | 8 | 24 | 13 | 52 | 16 | 64 | 0 | 0 | 0 | 0 |
| Total | | 1,047 | 3,141 | 1,301 | 3,903 | 509 | 2,036 | 598 | 2,392 | 64 | 128 | 78 | 156 |

a. Cyl = cows yearlong.
b. Aft = acre/feet.
c. Allotments which will receive initial reductions in livestock use.
d. Livestock numbers controlled.
e. Livestock numbers not controlled.
f. 784 AUMs actually available according to 1976 range survey; however, the allottee does not wish to license to the full extent possible.

Source: Bureau of Land Management.

| Wild Horses and Burros | | | | | | Livestock | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wild Horses | | | | Burros | | Current Allowable Use (entire allotment) | | Initial Stocking for Grazing Systems | | Initial Stocking Custodial Use Areas | | Estimated Potential Increase for Grazing Systems | | Initial – Reduction or + Increase | Potential Increase in Stocking-grazing Systems | Sediment Loss | | | | | |
| Present Population | | Objective (per MFP) | | Objective (per MFP) | | | | | | | | | | | | Present | | | Objective | | |
| No. | AUMs | No. | AUMs | No. | AUMs | AUMs | Cyl[a] | AUMs | Cyl | AUMs | Cyl | AUMs | Cyl | + Increase | grazing Systems | Aft[b]/Yr | Aft/Yr/ Sq Mi | | Aft/Yr | Aft/Yr/ Sq Mi | |
| 0 | 0 | 0 | 0 | 40 | 480 | 9,000 | 750 | 5,099[c] | 425 | | | 5,532 | 461 | –43% | 8% | 165.24 | .17 | | 158.88 | .16 | |
| 0 | 0 | 0 | 0 | 40 | 480 | 4,176 | 348 | 1,358[c] | 113 | 2,417[d] | 201 | 1,920 | 160 | –10 | 42 | 43.28 | .22 | | 38.81 | .20 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 9,600 | 800 | 2,617[c] | 218 | 1,636[d] | 136 | 3,036 | 253 | –56 | 16 | 40.76 | .28 | | 33.38 | .23 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 804 | 67 | 240[c] | 20 | 120[e] | 10 | 388 | 32 | –55 | 62 | 5.36 | .33 | | 4.66 | .28 | |
| 0 | 0 | 2 | 24 | 0 | 0 | 5,148 | 429 | 4,433[c] | 369 | | | 5,340 | 445 | –14 | 20 | 28.50 | .25 | | 24.95 | .22 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 1,925 | 160 | 1,791[c] | 150 | | | 2,328 | 194 | – 7 | 30 | 28.18 | .25 | | 24.25 | .21 | |
| 0 | 0 | 0 | 0 | 20 | 240 | 3,264 | 272 | 1,680[c] | 140 | 840[e] | 70 | 2,335 | 196 | –23 | 39 | 36.46 | .23 | | 33.01 | .20 | |
| 5 | 60 | 6 | 72 | 0 | 0 | 1,825 | 152 | 1,000[c] | 83 | | | 1,560 | 130 | –45 | 56 | 8.48 | .33 | | 6.87 | .27 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 961 | 80 | 708[c] | 59 | | | 1,080 | 90 | –26 | 53 | 6.16 | .31 | | 5.07 | .26 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 504 | 42 | 540 | 45 | | | 724 | 60 | + 7 | 34 | 3.84 | .33 | | 3.10 | .26 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 552 | 46 | 372[c] | 31 | | | 484 | 40 | –33 | 30 | 1.87 | .31 | | 1.69 | .28 | |
| 7 | 84 | 6 | 72 | 0 | 0 | 4,344 | 362 | 2,726[c] | 227 | 1,560[e] | 130 | 4,089 | 341 | – 1 | 50 | 26.96 | .27 | | 24.68 | .25 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 10,800 | 900 | 9,389[c] | 782 | | | 12,400 | 1,033 | –13 | 32 | 69.98 | .26 | | 59.68 | .23 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 2,641 | 220 | 2,232[c] | 186 | | | 2,760 | 230 | –15 | 24 | 21.49 | .29 | | 18.86 | .26 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 6,708 | 559 | 2,102[c] | 175 | 4,235[d] | 353 | 2,312 | 193 | – 6 | 10 | 39.99 | .27 | | 33.37 | .23 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 227 | 19 | 227[f] | 19 | | | 784 | 65 | 0 | 0 | 4.80 | .25 | | 4.66 | .24 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 15,360 | 1,280 | 15,360 | 1,280 | | | 15,360 | 1,280 | 0 | 0 | 34.30 | .21 | | 29.97 | .18 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 300 | 25 | 190[c] | 16 | | | 300 | 25 | –37 | 58 | 4.52 | .26 | | 4.17 | .24 | |
| 0 | 0 | 0 | 0 | 10 | 120 | 840 | 70 | 594[c] | 50 | | | 962 | 80 | –29 | 62 | 7.04 | .22 | | 5.99 | .19 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 5,353 | 446 | 5,353 | 446 | | | 5,353 | 446 | 0 | 0 | 23.00 | .21 | | 19.85 | .18 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 3,744 | 312 | 1,748[c] | 146 | | | 2,135 | 178 | –53 | 22 | 24.01 | .27 | | 19.44 | .22 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 2,580 | 215 | 1,145[c] | 95 | | | 1,920 | 160 | –56 | 68 | 5.58 | .22 | | 5.00 | .20 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 828 | 69 | 540[c] | 45 | | | 744 | 62 | –35 | 38 | 9.97 | .32 | | 8.75 | .28 | |
| 0 | 0 | 0 | 0 | 10 | 120 | | | | | | | | | | | 9.99 | .15 | | 9.90 | .15 | |
| 0 | 0 | 0 | 0 | 20 | 240 | | | | | | | | | | | 25.41 | .22 | | 22.69 | .20 | |
| 0 | 0 | 0 | 0 | 5 | 60 | | | | | | | | | | | 10.96 | .27 | | 10.47 | .26 | |
| 12 | 144 | 14 | 168 | 145 | 1,740 | 91,484 | 7,623 | 61,442 | 5,120 | 10,808 | 900 | 73,846 | 6,154 | | | 686.13 | | | 612.15 | | |

The Crozier Canyon allotment was intensively surveyed in 1958 using the ocular reconnaissance method. The Black Mountain, Ft. McEwen,* and Hackberry allotments were extensively surveyed as noted above in 1976 and 1977. The Portland Spring, Silver Creek, and Thumb Butte allotments, designated ephemeral range, were not surveyed for perennial grazing capacity.

In the ocular reconnaissance survey specific kinds of vegetative communities are carefully delineated on a map. A form is completed for each community, listing each plant species and the percent each species represents in proportion to the total. Vegetative density is recorded as the amount of ground surface that is covered with vegetation.

From this basic information and the use of a forage acre requirement, an estimated grazing capacity expressed in acres per animal unit month (AUM) is calculated for each vegetative community. Forage acre requirements were determined using data collected on the Mud Springs and Pine Springs allotments. (For details on forage acre requirement calculations, see memoranda in Kingman Resource Area files under 4412.11.)

After the current perennial forage production was determined, sufficient forage was reserved (not allocated to livestock) to support the existing and projected populations of wildlife and, where appropriate, the population of wild horses and burros established by MFP decisions. The forage in excess of the needs of wildlife and wild horses and burros was used as a basis for determining the initial carrying capacity for livestock.

If at the time of AMP implementation the burro numbers have not been reduced as recommended by MFP decision, a downward adjustment in initial stocking level will be necessary to prevent overcommitment of the forage resource.

The initial stocking rate for livestock (Table I-3) is based on the estimated grazing capacity of the public lands and of the grazing capacity of private and state-owned lands which are "controlled" by the livestock operator. On allotments having little or no "uncontrolled" land, the initial stocking rate will be at 90% of the estimated livestock grazing capacity to guard against the possibility of overgrazing in years of less than average precipitation and forage production.[1,2] Stocking will be adjusted whenever necessary on the basis of utilization and range trend studies correlated with climatic data and actual use records (see subsection on Evaluation, page I-20 for procedures).

Table I-3 also lists the management objectives of each allotment for wildlife habitat, wild horses and burros, soil stabilization, and livestock. It also shows current allowable use, initial stocking under the AMP, and estimated potential grazing capacity. The objectives for each category were developed from the following sources:

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*The portions of this allotment designated as ephemeral range were not surveyed.

- Wildlife Habitat -- Arizona State Game and Fish Department and BLM wildlife biologists

- Wild Horses and Burros -- MFP decisions

- Soil Stabilization -- BLM watershed study

- Livestock -- The total estimated potential grazing capacity, less the forage required to support the projected wildlife and wild horse and burro populations.

The initial reduction in livestock use subsequent to implementation of the proposed action was calculated as follows from information contained in Table I-3:

$$\text{Percent Reduction} = \frac{\text{Current Allowable AUMs-Initial Stocking Rate AUMs}}{\text{Current Allowable AUMs}}$$

$$= \frac{91,484 - (61,442 + 10,808)}{91,484}$$

$$= 21.$$

- Grazing Systems

The requirements of the vegetation are the basic considerations when designing a grazing system. Adequate rest from grazing must be provided to enable plants to produce and store carbohydrates for growth and reproduction, and to allow for reestablishment of new plants.

General factors considered in selecting grazing systems include:

- Allotment and shape.

- Physiographic characteristics.

- Vegetative factors -- present condition, production, present use, composition, physiological requirements, and estimated potential for improvement.

- Resource management objectives -- wildlife, watershed, soil, and recreation.

- Desired vegetative condition, composition, production, and degree of use.

- Sequence and timing of grazing to meet management objectives.

- The operator's livestock handling requirements and grazing system preference.

- Existing range improvements -- location and condition.

- Needed improvements and development practices.

- Resource specialists' professional judgment.

After a detailed consideration of these factors, BLM proposed several grazing systems for implementation in the Cerbat/Black Mountain ES area, as described below.

Santa Rita Grazing System

Use of this grazing system is proposed in areas meeting the following criteria:

- Two full spring and summer rest periods are required to restore or maintain range condition and plant vigor.

- Grazing system treatments must be tailored to the physiological requirements of both the cool and warm season plants within the plant community.

- The manipulation of vegetative communities to produce desirable species compositions through managed grazing is desired.

- The current pasture layout and allottee's general operation would enable this system to be implemented with little change in present management or existing improvements.

Allotments proposed for the Santa Rita system are Big Ranch, Black Mountain, Cane Springs, Cerbat/Quail Springs/Turkey Track, Dolan Springs, Ft. McEwen, Mineral Park, Mt. Tipton, Pine Springs, Stockton Hill, and Castle Rock (Table I-3).

Research at the Santa Rita Range Experiment Station near Tucson has shown that plant growth and reproduction are greatest when rest is provided during the growing season two years out of three.[3] Although total rainfall and its distribution pattern are more favorable near Tucson than in the Kingman area, soils, vegetation, and general climate are comparable enough to expect similar results.[4]

Tables I-4 and I-5 help illustrate the operation of the grazing system. The grazing formula shows the treatment to be applied to each pasture in sequence. The grazing schedule shows the treatment to be applied to several pastures within an allotment by year.

TABLE I-4

SANTA RITA GRAZING FORMULA

| Year | Spring Growing Season | | | | Summer Growing Season | | | | Winter Dormant Period | | | | Treatment Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | March | April | May | June | July | August | September | October | November | December | January | February | |
| 1 | – | – | – | – | – | – | – | – | x | x | x | x | Seed production, plant vigor, seed scattering and trampling |
| 2 | – | – | – | – | – | – | – | – | – | – | – | – | Establishment of seedlings, vegetative reproduction and vigor |
| 3 | x | x | x | x | x | x | x | x | – | – | – | – | Livestock production, stimulates growth |

Key: --- = Rest
xxx = Graze

TABLE I-5

SANTA RITA GRAZING SCHEDULE

| Year | Pasture | March | April | May | June | July | August | September | October | November | December | January | February |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1, 4, 7, etc. | A | – | – | – | – | – | – | – | – | x | x | x | x |
| | B | – | – | – | – | – | – | – | – | – | – | – | – |
| | C | x | x | x | x | x | x | x | x | – | – | – | – |
| 2, 5, 8, etc. | A | – | – | – | – | – | – | – | – | – | – | – | – |
| | B | x | x | x | x | x | x | x | x | – | – | – | – |
| | C | – | – | – | – | – | – | – | – | x | x | x | x |
| 3, 6, 9, etc. | A | x | x | x | x | x | x | x | x | – | – | – | – |
| | B | – | – | – | – | – | – | – | – | x | x | x | x |
| | C | – | – | – | – | – | – | – | – | – | – | – | – |

Key: --- = Rest
xxx = Graze

Rest during the growing season of the first year allows grasses and forbs to reach maturity and produce seed and allows shrubs to improve vigor and produce plant tissue. Grazing during the first dormant period aids in seed scattering and planting of seed by trampling.

Complete rest for the second year enables new grass and forb seedlings to become established, provides an additional year for seed production, and allows a full year for vegetative growth. Production of litter during this year of rest is also very important. Litter stabilizes the soil, increases water infiltration, reduces soil temperature in the summer, reduces evaporation, adds organic matter to the soil, and provides a seedbed for further production of annual and perennial forage.[5]

Forage is harvested during the third year stimulating new growth by removal of old growth. The higher intensity of grazing one year out of three (but not to exceed 60%) results in a more even utilization of the plant community and also forces cattle into areas that otherwise would be unused. The Santa Rita formula is in general based on growing seasons rather than phenological stages (flowering, seed ripe, etc.) as are the rest rotation systems.

Rest Rotation Grazing System

This system was proposed in areas meeting these criteria:

- Long periods of rest are required to restore range condition and plant vigor.

- Grazing system treatments must be tailored to the physiological requirements of specific key management species.

- Manipulation of vegetative communities to produce desirable species compositions through managed grazing is desired within a relatively short period of time.

- Imbalances in forage or water between pastures require more flexibility for grazing during the winter months.

A three-pasture rest rotation was proposed for the Canyon Ranch and the Diamond Bar/Gold Basin allotments (Table I-3). This grazing system is basically the same as the Santa Rita system but differs in that two pastures are grazed during the winter dormant period. (See Tables I-6 and I-7.)

The first two years are identical to the Santa Rita system. During the third year, however, some livestock are allowed to remain in the pasture grazed during the spring and summer (provided utilization is below 60%) while only some of the livestock are moved to the pasture scheduled for winter grazing. This practice provides more flexibility in compensating for any imbalances in forage or water between the two pastures. It can also be used to provide a separate pasture for calves after being weaned.[6]

TABLE I-6

THREE-PASTURE REST ROTATION GRAZING FORMULA

| Year | March | April | May | June | July | August | September | October | November | December | January | February | Treatment Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spring Growing Season | | | | Summer Growing Season | | | | Winter Dormant Period | | | | |
| 1 | – | – | – | – | – | – | – | – | x | x | x | x | Seed production, scat scattering and trampling, plant vigor |
| 2 | – | – | – | – | – | – | – | – | – | – | – | – | Establishment of seedlings, vegetative reproduction and vigor |
| 3 | x | x | x | x | x | x | x | x | x | x | x | x | Livestock production, stimulates growth |

Key: --- = Rest
xxx = Graze

TABLE I-7

THREE-PASTURE REST ROTATION GRAZING SCHEDULE

| Year | Pasture | March | April | May | June | July | August | September | October | November | December | January | February |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | – | – | – | – | – | – | – | – | x | x | x | x |
| 1, 4, 7, etc. | B | – | – | – | – | – | – | – | – | – | – | – | – |
| | C | x | x | x | x | x | x | x | x | x | x | x | x |
| | A | – | – | – | – | – | – | – | – | – | – | – | – |
| 2, 5, 8, etc. | B | x | x | x | x | x | x | x | x | x | x | x | x |
| | C | – | – | – | – | – | – | – | – | x | x | x | x |
| | A | x | x | x | x | x | x | x | x | x | x | x | x |
| 3, 6, 9, etc. | B | – | – | – | – | – | – | – | – | x | x | x | x |
| | C | – | – | – | – | – | – | – | – | – | – | – | – |

Key: --- = Rest
xxx = Graze

A four-pasture rest rotation is in operation on the mountain portion of the Upper Music allotment under an existing AMP. The lower desert portion of the Upper Music allotment is proposed for a three-pasture rest rotation as described above. The current four-pasture formula and schedule for this allotment are illustrated in Tables I-8 and I-9.

Deferred Grazing Systems

Deferred grazing systems are similar to rest rotation systems except that they do not provide for a full year of rest. Under deferred grazing, livestock use is delayed until forage plants reach certain predetermined stages. The system is designed phenologically to meet the physiological needs of the plants. This can provide an opportunity for old plants to gain vigor, new plants to become established, and for plants to set seed before being grazed.

Deferred systems were proposed in areas with the following characteristics:

- Allotment size and shape or physiography restricts management system options.

- Resource management objectives could be satisfied without long rest periods.

- Range condition and plant vigor could be maintained.

- Grazing use is already on a deferred system, and the range is either being maintained in good condition or is on an upward trend.

Allotments proposed for deferred systems are Curtain, Cedar Canyon, Clay Springs, Hackberry, Gediondia, Mud Springs, and Truxton Canyon. (See Table I-3.) (Specifics of grazing formulas can be examined in the proposed AMPs.)

The Music Mountain and Crozier Canyon allotments have been under existing AMPs and deferred grazing for eight and three years, respectively. Though the Music Mountain AMP is scheduled for revision in the near future, information gathered from the 1977 range survey has been used to estimate the initial stocking rate for the allotment in Table I-3. When completed, the revised AMP will also be analyzed for environmental impacts.

The Crozier Canyon AMP does not include a grazing system for that portion of the allotment lying west of Highway 66. It is anticipated that a grazing system will be developed, or at a later date the pasture will be incorporated into a grazing system with the lands to the west of Highway 66. In the interim, the lands west of the highway are to be managed custodially.

## TABLE I-8

### FOUR-PASTURE REST ROTATION GRAZING FORMULA

| Year | May | June | July | August | September | October | November | December | January | February | March | April | Treatment Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flowering Seed Ripe | | | | | | | | | | | | |
| 1 | x | x | x | x | x | x | x | x | x | x | x | x | Livestock production |
| 2 | – | – | – | x | x | x | x | x | x | x | x | x | Seed production and trampling |
| 3 | – | – | – | – | – | – | – | – | – | – | – | – | Seedling establishment and plant vigor |
| 4 | – | x | x | x | x | x | x | x | x | x | x | x | Seedling establishment and livestock production |

Key: xxx = Graze
--- = Rest

## TABLE I-9

### FOUR-PASTURE REST ROTATION GRAZING SCHEDULE

| Year | Pasture | May | June | July | August | September | October | November | December | January | February | March | April |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1, 5, etc. | A | x | x | x | x | x | x | x | x | x | x | x | x |
| | B | – | – | – | x | x | x | x | x | x | x | x | x |
| | C | – | – | – | – | – | – | – | – | – | – | – | – |
| | D | – | x | x | x | x | x | x | x | x | x | x | x |
| 2, 6, etc. | A | – | – | – | x | x | x | x | x | x | x | x | x |
| | B | – | – | – | – | – | – | – | – | – | – | – | – |
| | C | – | x | x | x | x | x | x | x | x | x | x | x |
| | D | x | x | x | x | x | x | x | x | x | x | x | x |
| 3, 7, etc. | A | – | – | – | – | – | – | – | – | – | – | – | – |
| | B | – | x | x | x | x | x | x | x | x | x | x | x |
| | C | x | x | x | x | x | x | x | x | x | x | x | x |
| | D | – | – | – | x | x | x | x | x | x | x | x | x |
| 4, 8, etc. | A | – | x | x | x | x | x | x | x | x | x | x | x |
| | B | x | x | x | x | x | x | x | x | x | x | x | x |
| | C | – | – | – | x | x | x | x | x | x | x | x | x |
| | D | – | – | – | – | – | – | – | – | – | – | – | – |

Key: xxx = Graze
--- = Rest

Ephemeral Grazing System

Certain portions of the ES area have been designated as "ephemeral range," in accordance with the Ephemeral Range Special Rule as found in Title 43 of the Code of Federal Regulations (4115.2-4). Under this rule, ephemeral (annual) grazing is authorized on ranges which lie within the general Southwest desert region extending primarily into southern Arizona, California, and Nevada and including portions of the Mohave, Sonoran, and Chihuahuan deserts. Ephemeral range does not consistently produce forage, but periodically provides annual vegetation suitable for livestock grazing. In years of abundant moisture and other favorable climatic conditions, a large amount of forage may be produced. Favorable years, however, are unpredictable, and the season is short.

Under the special rule, guidelines for designating allotments as ephemeral range include:

- Area falls generally below the eight-inch precipitation isoline and below the 3200-foot contour line.

- A minor percentage of the total plant composition is made up of desirable perennial forage plants.

On allotments designated as ephemeral range (Table I-3), livestock are placed on the range only when the potential for ephemeral forage exists, or after it is available. In response to or in anticipation of an ephemeral grazing application, a range conservationist examines the allotment to determine the potential for production of adequate forage to support livestock. The carrying capacity estimate is based on 50% of the anticipated production, the remaining 50% of which is reserved for wildlife, watershed, and seed production. Factors considered include the current stage of growth, climatic conditions (present and anticipated), and available moisture in the root zone (within 18 inches of the surface).

- Flexibility

Flexibility in grazing systems is desirable for two reasons: to avoid imposing a major economic hardship on the range user by forcing him to alternately dispose of and then acquire livestock in response to short-term changes in climatic conditions; and to guard against damage to the vegetative/soil resource by holding to a preestablished formula regardless of changing climate conditions.

Summer thunderstorms often drop rain in one pasture while an adjacent pasture remains dry. Because of the variability in forage production, some deviation from the grazing schedule may be necessary. It is anticipated that more flexibility will be required during the first grazing cycle concurrent with range studies designed to monitor stocking rates and range conditions (see Evaluation, page I-20). This will probably result in deferred grazing during the first grazing cycle (three or four years) for the Santa Rita and rest rotation systems. As final stocking rates are determined and range condition improves, it is anticipated that less deviation from the grazing schedules will be necessary.

Range condition, competition with wildlife, amount of available forage and water, and time of year will be considered when deciding when and where to move livestock. In no case will utilization be allowed to exceed an average of 60% in the pasture scheduled for grazing. Any deviation from the grazing schedule must receive BLM's prior approval. Achieving AMP multiple-use objectives will be the primary concern in the consideration of any changes in the grazing schedule.

Adjustments will be made to:

- Authorize the movement of livestock from one pasture to another ahead of schedule, due to lack of forage in the first and the availability of forage in the second.

- Hold livestock in the pasture longer than scheduled, if utilization has not reached 60%.

- Allow use in the "rest" pasture if it has abundant forage while, due to rainfall pattern, forage is temporarily unavailable in the "graze" pastures.

- Reduce livestock numbers in response to a lack of forage production in any one season or growing year.

- Increase or decrease livestock numbers temporarily to achieve a predetermined degree of utilization. (For example, if achieving a degree of hedging on browse species is desirable to benefit wildlife habitat, a temporary increase in livestock numbers may be warranted.)

- • Evaluation

BLM manual procedures (BLM Manuals 4412.2, 4413, and 6630) will be followed in conducting range and habitat studies to evaluate and adjust the allotment management plans. These studies include actual use, utilization, climate analyses, range trend, herbage production, and plant phenology. Study locations are identified in the objectives section and on the vegetation overlay for each AMP. Further in-depth analysis of study location will be made prior to implementation. The results of all these studies will be considered in making adjustments in the grazing system or the allowable livestock use levels.

Key areas representative of various vegetation communities are selected in each pasture. These key areas are used as sites for the evaluation studies. Most allotments have three or more pastures and each pasture may have several key areas.

Within each key area, key plant species are used to indicate contemporary range condition, trends in range condition, and intensity of grazing. These species are chosen for their relative palatability and nutritive value for livestock, wildlife, or both. They are responsive to changes in grazing and are well adapted to the area being studied. Each AMP identifies and describes the key species relative to the particular allotment.

The key forage plant method of measuring utilization will be used to monitor grazing intensity and to help determine (along with range and habitat condition and trend) whether adjustments in stocking are needed. The key forage plant method is an ocular estimate of the degree to which selected forage plants (key species) have been grazed or browsed. Five utilization classes are used to designate relative degree of use. (BLM Manual 4412.22B7c describes these methods in detail.) BLM range and wildlife personnel will measure average utilization of the suitable range in the "graze pasture" by or near the end of each grazing period. Records will show livestock numbers and dates for each grazing unit or pasture designated in the grazing schedule, and must be submitted to the BLM at the end of each grazing period. BLM personnel will make periodic checks to assure that the correct stocking levels are maintained.

On allotments with no uncontrolled range, utilization of up to 60% would be allowed in pastures that are grazed only one year out of three during the growing season. This degree of use is generally classified as moderate. Sixty percent utilization in the used pastures, in conjunction with scheduled rest periods, will result in light stocking on the allotment.

The stocking rate will be adjusted on the basis of utilization according to the following formula in which utilization of 60% is the controlling factor:

$$Sx = \frac{a}{a + b} \times \frac{(60\% \times Sp)}{Uo}$$

Where: Sx = adjusted stocking (AUMs)

Sp = present stocking (AUMs)

Uo = observed utilization (percent)

a = total grazing capacity of public land plus privately-controlled range (AUMs)

b = total grazing capacity of private uncontrolled range (AUMs) on the entire allotment.

Federal law (CFR, Title 43) does not allow licensing of grazing in excess of the capacity of the public land, and state law (Arizona Revised Statute, Title 24)[7] does not allow stocking in excess of the capacity of the land that the livestock owner owns or has the lawful right to use unless his land is fenced. Use licensed by the BLM includes the capacity of the privately-controlled range in the regular license, but it cannot include the capacity of the uncontrolled range. Achieving 60% utilization on an area containing uncontrolled land indicates that even though the

grazing capacity of the entire range is not being exceeded, the existing licensed use would actually include the capacity of the uncontrolled range. Therefore, the adjusted stocking based on utilization must be modified by the ratio of controlled range (a) to total available range (a+b) as shown in the formula. Adjustments in livestock grazing use will include consideration of factors other than degree of forage utilization -- specifically, watershed condition, wildlife habitat condition, results of range condition and trend studies, and climatic conditions.

Rain gauges will be placed in each pasture to monitor precipitation patterns. The allottee will measure and record precipitation every other month and, after each significant rainfall, submit the data to BLM along with the actual use records.

Trend is the change in vegetation and soil characteristics directly resulting from environmental factors, primarily precipitation and grazing. Permanent trend plots will be established in key areas, with the use of standard procedures prescribed in BLM Manual 4412.22C. General and overhead photos taken each year will be used to observe changes in ground cover, plant vigor, and species composition. The BLM Manual provides that the trend plots be "read" at or near the end of the grazing use period.

Decisions affecting future stocking levels will consider the trend in range condition along with stocking rates in relation to the estimated carrying capacity, climatic conditions, and results of utilization studies.

In addition to the manual procedures for range and habitat trend studies, permanent pace-point transects are established at each study location to monitor changes in plant density and species composition. The length of the transect will be dependent upon initial plant density (to assure a reliable sample), but will normally be 300 paces. The closest perennial plant species will be recorded at each pace. The starting point will be the trend plot. The transect will be paced in the same direction as the general trend photo is taken, and end at a permanently established point. The permanent pace transect will normally be "read" at the same time as the trend plots.

- Range Improvements

Range improvements such as fences, water developments, and pipelines are needed on most allotments to implement the grazing systems. The locations of existing and proposed improvements are shown in Figures I-3 and I-4,* respectively, and are also described in the appendices of the individual APMs. Table I-10 lists the cost of proposed improvements for each allotment.

Areas proposed for range improvements and vegetation manipulation will be surveyed prior to construction to determine the presence or absence of cultural and/or paleontological resources, and threatened and endangered plants

*Figures I-3 and I-4 will be found in the "pocket" at the end of this volume.

**TABLE I-10**

**COST OF PROPOSED RANGE IMPROVEMENTS**

| Construction Schedule | Allotment | Type of Improvement | Units BLM | Units Private | Approximate Cost per Unit | Approximate Improvement Cost BLM | Approximate Improvement Cost Private | Approximate Allotment Cost BLM | Approximate Allotment Cost Private |
|---|---|---|---|---|---|---|---|---|---|
| Year 1 | Ft. McEwen | Spring development, horizontal well/trough | 1 each | | $ 1,800 | $ 1,800 | | | |
| | | Pipeline, 1¼ in PE (polyethylene) | 5 miles | 5 miles | 3,900 | 19,500 | $19,500 | | |
| | | Storage with trough – 5,000 gal | 3 each | 2 each | 1,000 | 3,000 | 2,000 | | |
| | | Storage, 30,000 gal – steel | | 1 each | 3,500 | | 3,500 | $ 24,300 | $ 25,000 |
| | Cane Springs | Fence – Type A | 7.05 miles | 0.75 mile | 2,500 | 17,625 | 1,875 | | |
| | | Spring development | 6 each | 1 each | 700 | 4,200 | 700 | | |
| | | Trough/steel installed | 9 each | 1 each | 400 | 3,600 | 400 | | |
| | | Pipeline, 1¼ in PE | 2.2 miles | | 3,900 | 8,580 | | | |
| | | Storage, 12,000 gals | 1 each | | 1,700 | 1,700 | | 35,705 | 2,975 |
| | Mineral Park | Fence – Type A | 6.7 miles | 0.3 mile | 2,500 | 16,750 | 750 | | |
| | | Cattleguard | 1 each | | 2,800 | 2,800 | | | |
| | | Spring development, horizontal well/trough | 1 each | 1 each | 1,800 | 1,800 | 1,800 | | |
| | | Storage, 5,000 gals – concrete | 1 each | | 1,000 | 1,000 | | | |
| | | Storage, 10,000 gals – concrete | 1 each | | 1,700 | 1,700 | | | |
| | | Trough – concrete bottom/ steel top | 1 each | | 2,100 | 2,100 | | | |
| | | Well/windmill, 300 ft deep | 1 each | | 15,050 | 15,050 | | | |
| | | Well/windmill, 150 ft deep | 2 each | | 10,625 | 21,250 | | 62,450 | 2,550 |
| | Castle Rock | Fence – Type A | 7.2 miles | 1.3 miles | 2,500 | 18,000 | 3,250 | | |
| | | Corral | | 1 each | 600 | | 600 | | |
| | | Cattleguard | 1 each | | 2,800 | 2,800 | | | |
| | | Rainwater catchment | 1 each | | 10,000 | 10,000 | | | |
| | | Pipeline, 1¼ in PE | | 0.25 mile | 3,900 | | 975 | | |
| | | Trough – steel, installed | 2 each | | 400 | 800 | | | |
| | | Storage, 5,000 gals | | 1 each | 1,000 | | 1,000 | | |
| | | Spring development/horizontal well/trough | 1 each | | 1,800 | 1,800 | | 33,400 | 5,825 |
| | Gediondia | Fence – Type A | 8.5 miles | 1.5 miles | 2,500 | 21,250 | 3,750 | | |
| | | Horizontal well with trough | 4 each | 3 each | 1,800 | 7,200 | 5,400 | | |
| | | Spring development | 1 each | 4 each | 700 | 700 | 2,800 | | |
| | | Trough – steel, installed | 4 each | 4 each | 1,600 | 1,600 | | | |
| | | Storage, 5,000 gals – concrete | 5 each | 4 each | 1,000 | 5,000 | 4,000 | | |
| | | Pipeline, 1¼ in PE | 1.5 miles | | 3,900 | 5,850 | | | |
| | | Cattleguard | 1 each | 1 each | 2,800 | 2,800 | 2,800 | 44,400 | 20,350 |
| | Upper Music | Spring development | 3 each | | 700 | 2,100 | | | |
| | | Pipeline, 1¼ in PE | 0.75 mile | | 3,900 | 2,925 | | | |
| | | Trough – steel, installed | 2 each | | 400 | 800 | | | |
| | | Storage, 5,000 gals – concrete | 3 each | | 1,000 | 3,000 | | | |
| | | Fence waters | 0.5 mile | | 2,500 | 1,250 | | | |
| | | Corrals | | 3 each | 600 | | 1,800 | 10,075 | 1,800 |
| | Mud Springs | Cattleguards | 5 each | | 2,800 | 14,000 | | | |
| | | Horizontal well/trough | 2 each | | 1,800 | 3,600 | | | |
| | | Pipeline, 1¼ in PE | 4.3 miles | 2.2 miles | 3,900 | 16,770 | 8,580 | | |
| | | Trough – steel, installed | 2 each | 1 each | 400 | 800 | 400 | | |
| | | Storage, 5,000 gals – concrete | 2 each | 1 each | 1,000 | 2,000 | 1,000 | | |
| | | Rain catchment | | 2 each | 10,000 | | 20,000 | | |
| | | Fence – Type A | 2 miles | | 2,500 | 5,000 | | | |
| | | Fence 10, water development | 0.75 mile | 0.75 mile | 2,500 | 1,875 | 1,875 | | |
| | | Dirt reservoir | 1 each | 2 each | 5,500 | 5,500 | 11,000 | 49,545 | 42,855 |

TABLE I-10 (Continued)

| Construction Schedule | Allotment | Type of Improvement | Units | | Approximate Cost Per Unit | Approximate Improvement Cost | | Approximate Allotment Cost | |
|---|---|---|---|---|---|---|---|---|---|
| | | | BLM | Private | | BLM | Private | BLM | Private |
| Year 1 | Canyon Ranch | Well/windmill, 150 ft | | 2 each | $10,625 | | $21,250 | | |
| | | Storage, 5,000 gals – concrete/trough | | 2 each | 1,000 | | 2,000 | | |
| | | Horizontal well with trough | 1 each | | 1,800 | $ 1,800 | | | |
| | | Fence – Type A | 5 miles | 2 miles | 2,500 | 12,500 | 5,000 | | |
| | | Cattleguard | 2 each | | 2,800 | 5,600 | | $ 19,900 | $ 28,250 |
| | Diamond Bar/Gold Basin | Spring development | | 1 each | 700 | | 700 | | |
| | | Trough | 11 each | 2 each | 400 | 4,400 | 800 | | |
| | | Storage, 5,000 gals – concrete | 12 each | 2 each | 1,000 | 12,000 | 2,000 | | |
| | | Well/windmill, 150 ft | 2 each | | 10,625 | 21,250 | | | |
| | | Pipeline, 1¼ in PE | 11 miles | 6.5 miles | 3,900 | 42,900 | 25,350 | | |
| | | Pipeline, 1½ in PVC | 0.75 mile | 2.25 miles | 8,500 | 6,375 | 19,125 | | |
| | | Fence – Type A | 6 miles | 4 miles | 2,500 | 15,000 | 10,000 | | |
| | | Dirt reservoir | 2 each | | 5,500 | 11,000 | | 112,925 | 57,975 |
| | Total for Year 1 | | | | | | | $ 392,700 | $187,580 |
| Year 2 | Crozier Canyon | Fence – Type D, antelope | 2.75 miles | 1.5 miles | 2,500 | 6,875 | 3,750 | | |
| | | Fence – Type A | 1 mile | | 2,500 | 2,500 | | | |
| | | Fence repair | 10 miles | 2 miles | 300 | 3,000 | 600 | | |
| | | Pipeline, 1¼ in PE | 0.5 mile | 1 mile | 3,900 | 1,950 | 3,900 | | |
| | | Storage , 12,000 gals – concrete | 2 each | 2 each | 1,700 | 3,400 | 3,400 | | |
| | | Trough – steel, installed | 3 each | 4 each | 400 | 1,200 | 1,600 | | |
| | | Well/windmill, 150 ft | 1 each | | 10,625 | 10,625 | | | |
| | | Dirt reservoir | 2 each | 1 each | 5,500 | 11,000 | 5,500 | | |
| | | Reservoir improvement | | 1 each | 1,500 | | 1,500 | | |
| | | Rain catchment | 2 each | | 10,000 | 20,000 | | | |
| | | Spring development | | 2 each | 700 | | 1,400 | $ 60,550 | $ 21,650 |
| | Mt. Tipton | Fence – Type A | 4.5 miles | 1.5 miles | 2,500 | 11,250 | 3,750 | | |
| | | Pipeline, 1¼ in PE | .5 mile | 1.5 miles | 3,900 | 1,950 | 5,850 | | |
| | | Storage, 5,000 gals – concrete | 1 each | 1 each | 1,000 | 1,000 | 1,000 | | |
| | | Trough – steel, installed | 1 each | 1 each | 400 | 400 | 400 | | |
| | | Rain catchment | 3 each | 1 each | 10,000 | 30,000 | 10,000 | | |
| | | Burn and reseed | 800 acres | 1,120 acres | 8 | 6,400 | 8,960 | 51,000 | 29,960 |
| | Cerbat/Quail Springs/Turkey Track | Dirt reservoir | 6 each | | 5,500 | 33,000 | | | |
| | | Repair (seal) reservoir | 2 each | | 400 | 800 | | | |
| | | Rain catchment | 1 each | | 10,000 | 10,000 | | | |
| | | Well/windmill | 2 each | | 12,041 | 24,082 | | | |
| | | Horizontal well with trough | 3 each | | 1,800 | 5,400 | | | |
| | | Spring development | 2 each | | 700 | 1,400 | | | |
| | | Pipeline, 1¼ in PE | 5.2 miles | 3 miles | 3,900 | 20,280 | 11,700 | | |
| | | Storage, 12,000 gals – concrete | 2 each | | 1,700 | 3,400 | | | |
| | | Trough – steel, installed | 6 each | 2 each | 400 | 2,400 | 800 | | |
| | | Storage, 5,000 gals – concrete | 1 each | 1 each | 1,000 | 1,000 | 1,000 | | |
| | | Fence – Type A | 10.8 miles | 2.6 miles | 2,500 | 27,000 | 6,500 | | |
| | | Cattleguard | 1 each | | 2,800 | 2,800 | | 131,562 | 20,000 |
| | Total for Year 2 | | | | | | | $ 243,112 | $ 71,610 |
| Year 3 | Stockton Hill | Fence waters with triggers | 4 each | | 300 | 1,200 | | | |
| | | Fence repair | 4 miles | 1 mile | 300 | 1,200 | 300 | | |
| | | Fence – Type A | 1 mile | 1.8 miles | 2,500 | 2,500 | 4,500 | | |
| | | Storage, 10,000 gals – concrete | 3 each | | 1,700 | 5,100 | | $ 10,000 | $ 4,800 |

TABLE I-10 (Continued)

| Construction Schedule | Allotment | Type of Improvement | Units | | Approximate Cost per Unit | Approximate Improvement Cost | | Approximate Allotment Cost | |
|---|---|---|---|---|---|---|---|---|---|
| | | | BLM | Private | | BLM | Private | BLM | Private |
| Year 3 | Black Mountain | Well/windmill, 100 ft | 1 each | | $ 9,150 | $ 9,150 | | | |
| | | Horizontal well | 2 each | | 1,800 | 3,600 | | | |
| | | Rain catchment | 1 each | | 10,000 | 10,000 | | | |
| | | Pipeline, 1¼ in PE | 6.5 miles | 0.5 mile | 3,900 | 25,350 | $ 1,950 | | |
| | | Storage, 10,000 gals – concrete | 1 each | | 1,700 | 1,700 | | | |
| | | Trough – steel, installed | 4 each | | 400 | 1,600 | | | |
| | | Fence – Type A | 29.25 miles | 2.75 miles | 2,500 | 73,125 | 6,875 | | |
| | | Cattleguard | 1 each | | 2,800 | 2,800 | | | |
| | | Corral | | 3 each | 600 | | 1,800 | $ 127,325 | $ 10,625 |
| | Big Ranch | Fence repair | 2 miles | 5.75 miles | 200 | 400 | 1,150 | | |
| | | Pipeline rebuild | 12.25 miles | | 3,900 | 47,775 | | | |
| | | Storage repair | | 3 each | 300 | | 900 | | |
| | | Trough repair | | 8 each | 200 | | 1,600 | | |
| | | Well/windmill repair | | 7 each | 1,000 | | 7,000 | | |
| | | Spring development repair | | 3 each | 100 | | 300 | | |
| | | Corral repair | | 1 each | 100 | | 100 | 48,175 | 11,050 |
| | Truxton Canyon | Horizontal well | 2 each | | 1,800 | 3,600 | | | |
| | | Pipeline, 1¼ in PE | 1.25 miles | | 3,900 | 4,875 | | | |
| | | Trough – steel, installed | 2 each | | 400 | 800 | | | |
| | | P-J chaining and reseeding | 705 acres | | 16 | 11,280 | | 20,555 | |
| | Total for Year 3 | | | | | | | $ 206,055 | $ 26,475 |
| Year 4 | Pine Springs | Fence – Type A | 3 miles | | 2,500 | 7,500 | | | |
| | | Cattleguard | 2 each | | 2,800 | 5,600 | | | |
| | | Pipeline, 1¼ in PE | 1.5 miles | | 3,900 | 5,850 | | | |
| | | Storage, 10,000 gals – concrete | 1 each | | 1,700 | 1,700 | | | |
| | | Trough – steel, installed | 2 each | | 400 | 800 | | | |
| | | Horizontal well | 3 each | | 1,800 | 5,400 | | | |
| | | Storage, 20,000 gals – steel | 2 each | | 2,800 | 5,600 | | $ 32,450 | |
| | Cedar Canyon | None proposed | | | | | | | |
| | Dolan Springs | Fence – Type A | 14 miles | 2.25 miles | 2,500 | 35,000 | 5,625 | | |
| | | Cattleguard | | 1 each | 2,800 | | 2,800 | | |
| | | Pipeline, 1¼ in PE | 6.6 miles | 3.45 miles | 3,900 | 25,740 | 13,455 | | |
| | | Storage, 5,000 gals – concrete | 5 each | | 1,000 | 5,000 | | | |
| | | Trough – steel, installed | | 1 each | 400 | | 400 | | |
| | | Well/windmill redevelopment | 2 each | | 7,550 | 15,100 | | | |
| | | Horizontal well | 1 each | 2 each | 1,800 | 1,800 | 3,600 | 82,640 | 25,880 |
| | Hackberry | Pipeline, 1¼ in PE | 3.4 miles | 0.6 mile | 3,900 | 13,260 | 2,340 | | |
| | | Spring development | 2 each | | 700 | 1,400 | | | |
| | | Storage, 5,000 gals – concrete | 1 each | 1 each | 1,000 | 1,000 | 1,000 | 15,660 | 3,340 |
| | Silver Creek | None proposed | | | | | | | |
| | Thumb Butte | Fence – Type A | 10.5 miles | | 2,500 | 26,250 | | | |
| | | Well/windmill – 200 ft | 1 each | | 14,591 | 14,591 | | | |
| | | Storage, 20,000 gals – steel | 1 each | | 2,800 | 2,800 | | | |
| | | Trough – steel, installed | 1 each | | 400 | 400 | | 44,401 | |
| | Portland Spring | None Proposed | | | | | | | |

TABLE I-10 (Continued)

| Construction Schedule | Allotment | Type of Improvement | Units BLM | Units Private | Approximate Cost per Unit | Approximate Improvement Cost BLM | Approximate Improvement Cost Private | Approximate Allotment Cost BLM | Approximate Allotment Cost Private |
|---|---|---|---|---|---|---|---|---|---|
| Year 4 | Curtain | Pipeline, 1¼ in PE | .5 mile | 1 mile | $ 3,900 | $ 1,950 | $ 3,900 | | |
| | | Storage, 5,000 gals – concrete | 1 each | | 1,000 | 1,000 | | | |
| | | Trough – steel, installed | 1 each | | 400 | 400 | | $ 3,350 | $ 3,900 |
| | Clay Springs | Fence – Type A | 2 miles | 1.5 mile | 2,500 | 5,000 | 3,750 | | |
| | | Pipeline, 1¼ in PE | 3.25 miles | | 3,900 | 12,675 | | | |
| | | Trough – steel, installed | 2 each | | 400 | 800 | | 18,475 | 3,750 |
| | Music Mountain | None Proposed | | | | | | | |
| | Total for Year 4 | | | | | | | $ 196,976 | $ 36,870 |
| | Grand Total | | | | | | | $1,038,843 | $322,535 |

Source: Bureau of Land Management.

and/or animals. If cultural or paleontological resources are discovered, the project will be modified to avoid disturbing the site, abandoned if it cannot be successfully modified, or constructed after the site has been scientifically salvaged. If threatened and endangered plants and/or animals are found, the project will be abandoned or relocated if the improvements diminish the value of the habitat for the given species.

A visual impact analysis will also be conducted prior to improvement construction. When visual resources are impaired, range improvements will be modified by design and/or location to "blend" the improvement(s) with the natural landscape of the site and surrounding area.

Stock waters will be developed to allow access by wildlife at all times. Ladders or ramps will allow safe use by small animals and birds. Where possible, fenced wildlife waters will be placed at ground level and in an area of dense cover at or near each proposed or existing livestock water.

Well Development

Wells will be drilled either vertically or horizontally depending on the location of the water-bearing strata. They may be flowing or require pumping to discharge the water. There are several methods of pumping; those intended for use are described in Appendix A.

Water from free-flowing wells will be developed for wildlife at the well site and along pipelines distributing the water from the well.

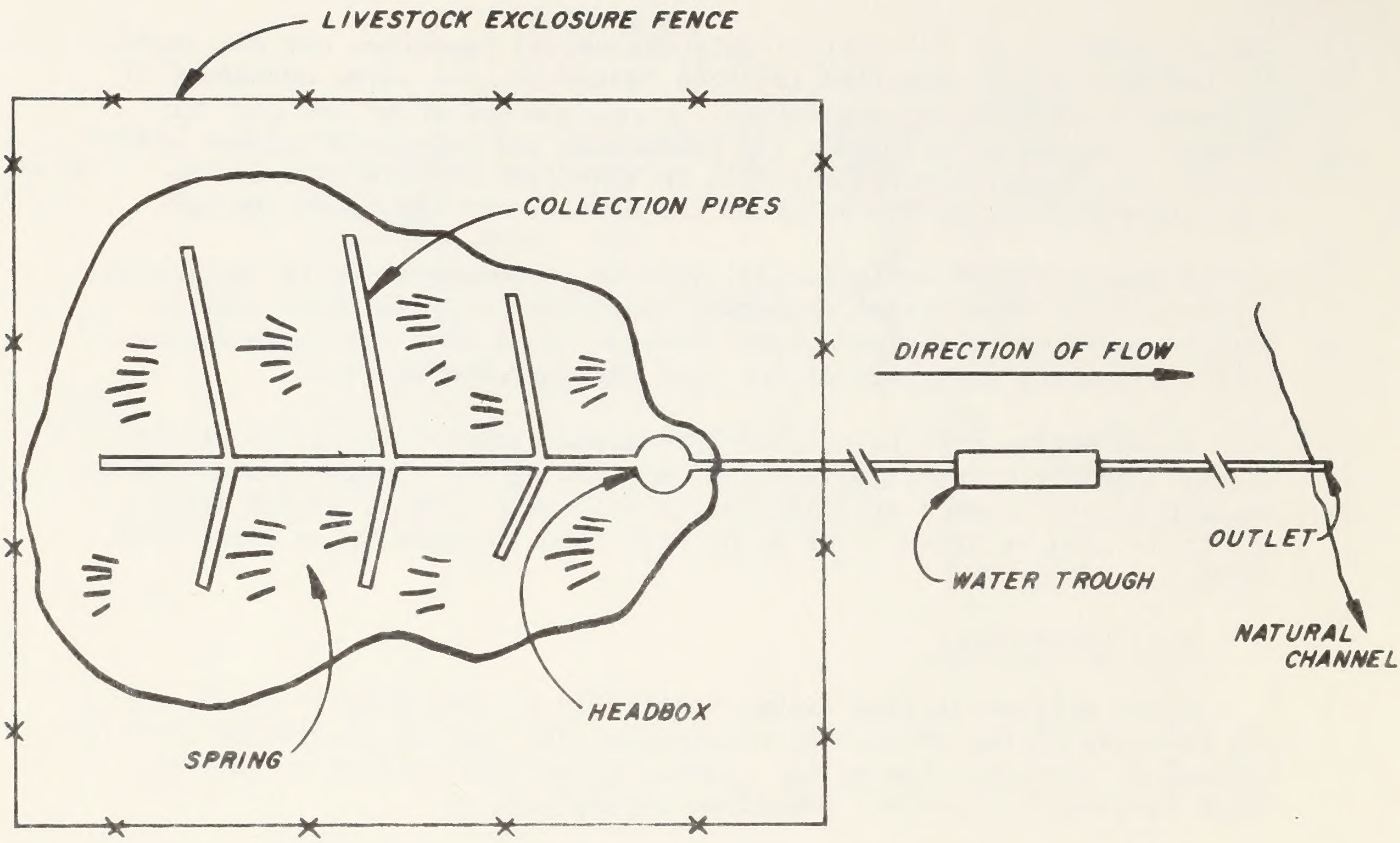
Spring Development

Only water surplus to the needs of riparian or meadow vegetation and wildlife may be developed for livestock use. The water will be developed to provide free water at the source for wildlife and sufficient water for existing riparian and meadow vegetation.

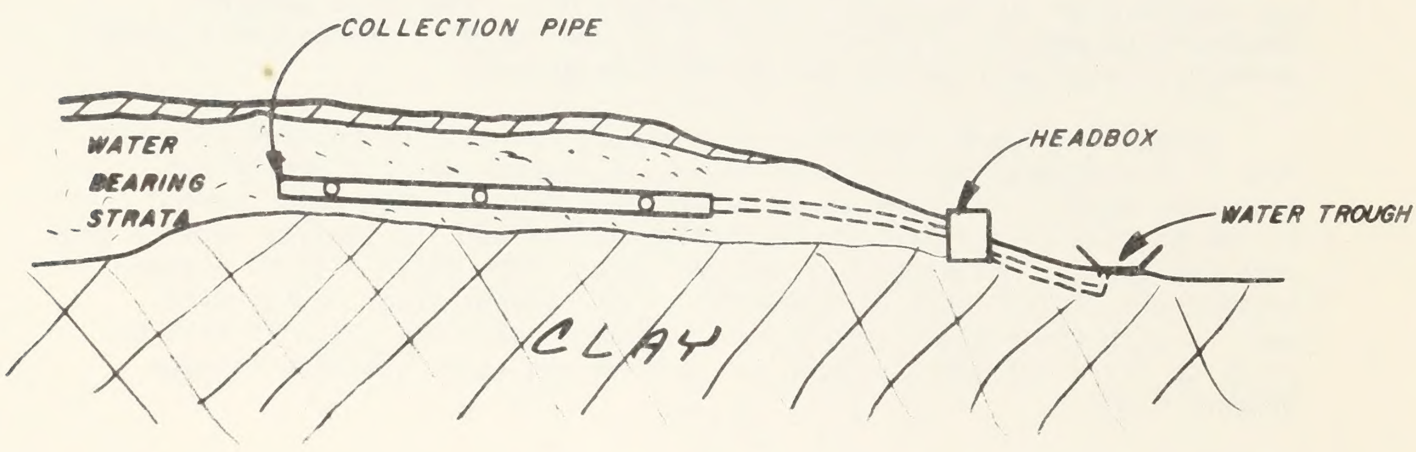
Spring developments consist of a spring box, either located directly over a concentrated water source or with a system that collects water from many seeps. At sites where water seeps from a large area instead of discharging at a point, the gathering devise will be 1½-inch plastic pipe with two rows of holes on their bottom sides. The pipes will be buried horizontally at the base of the water table in that area. Water will move through the pipes to the water collection box from which it will be piped to the water storage tank and then to the stock watering troughs (Figure I-5).

Reservoirs

- Earthfill Type. Earthfill dam sites are prepared by using a bulldozer to remove all debris, including rocks and vegetation, from the reservoir site. After the surface is cleared, a cut-off trench is dug




AERIAL VIEW




SECTIONAL VIEW

FIGURE 5 SPRING DEVELOPMENT

to prevent water from flowing under the dam. The trench must be cut into a clay or rock surface below any gravel lens that might be encountered in digging. Such a trench should be approximately 4 feet deep and 12 feet wide (Figure I-6).

Once backfilling and construction of the dam begin, suitable clay-bearing soil will be scraped from above the dam or borrow pit and placed in the cut-off trench. The dam will then be contructed above the ground by use of a crawler tractor and scraper.

All earthfill dams will have a spillway or overflow outlets with gradients not to exceed 3%. Where a suitability spillway is not available, an outlet pipe may be used instead. The water will back up and fill the basin to the height of the spillway, creating a pond upstream from the dam.

When needed, this stored water can be transported by pipeline watering facilities below the dam. The dam and reservoir will be fenced from livestock to eliminate damage and contamination and to provide habitat for wildlife.

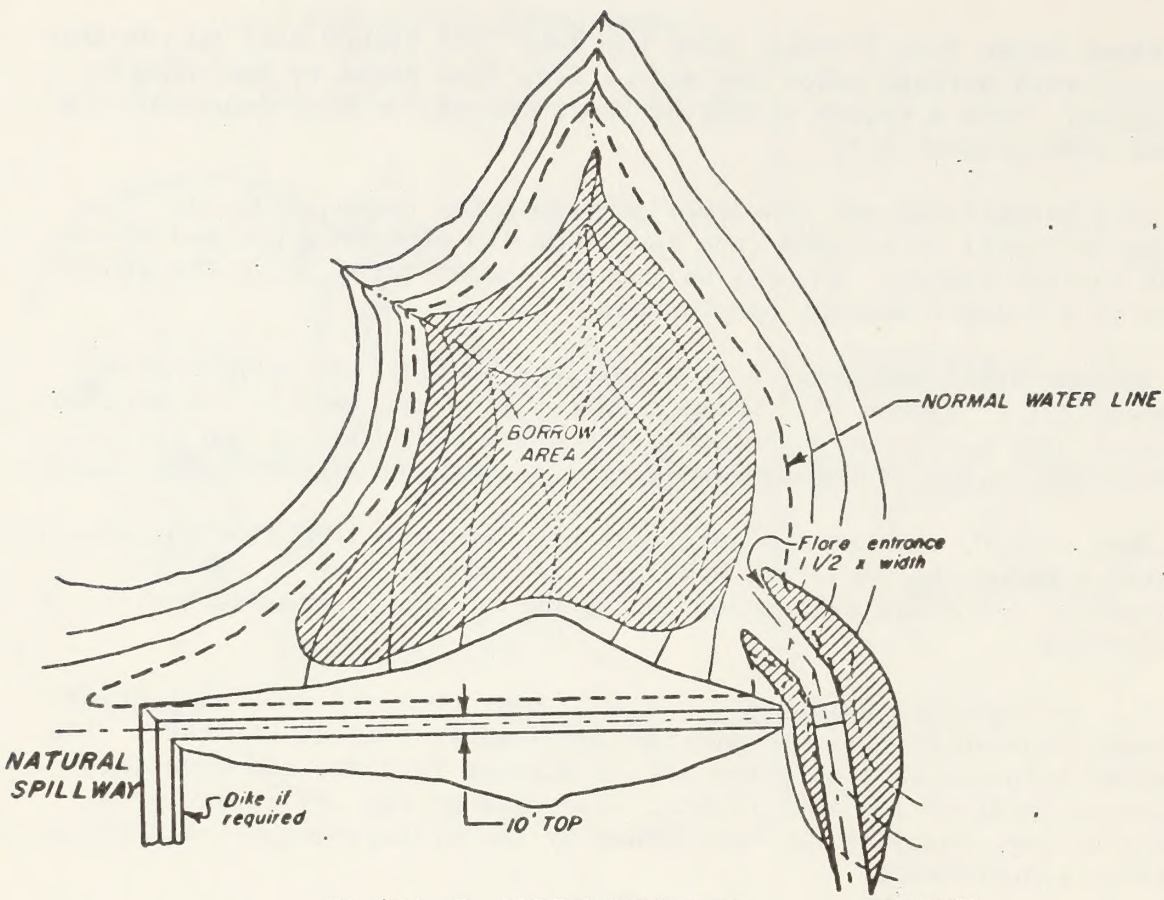
- Rainfall Catchments. A catchment consists of a collection area made from an impervious material designed to collect rainfall. The collected rainfall will be piped into a storage facility and then into a drinking facility for the animals. The size of the collection area and the storage facility are determined by the average annual rainfall and water requirements.

One type of catchment uses asphalt-fiberglass for the collection area. Approximately one acre will be cleared of all vegetation and smoothed to a slope of from 5-15% with no sharp rock protruding. All rocks larger than one inch will be removed. The soil will then be sterilized to prevent any vegetation from growing through the apron. A fiberglass mat will be placed on the cleared area and impregnated with asphalt. A low berm or dike will be constructed around the perimeter of the catchment (Figure I-7).

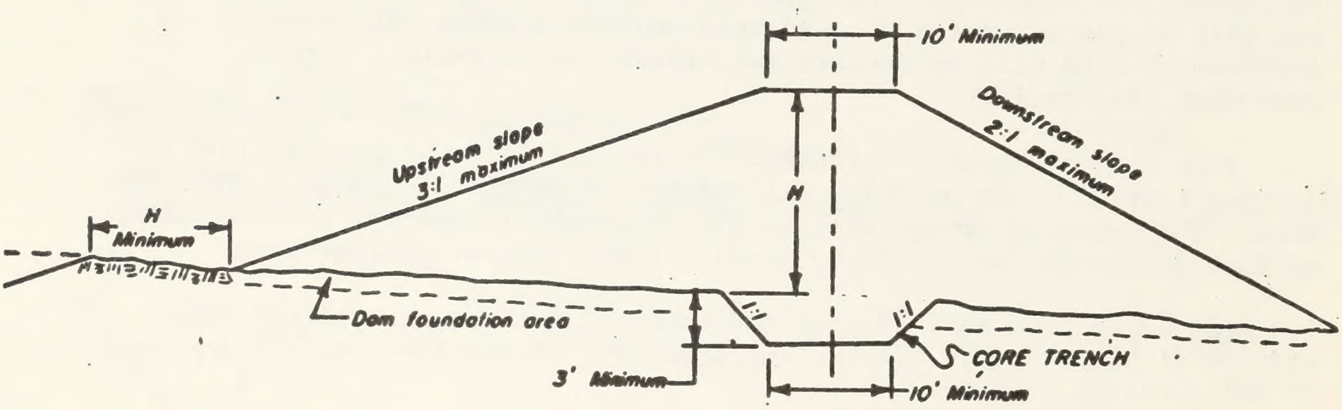
From the catchment structure the water will flow by gravity into a storage tank, the top of which will be placed below the grade of the inlet pipe. The drinking trough will be placed downhill from the storage tank, so that it too can be filled by gravity flow from the storage tank.

The vegetation scraped from the water collecting and storage tank areas will be placed in ditches and scattered around the construction area to help prevent erosion.

- Pipelines. Pipelines will be constructed to carry water from its source (well, stream, spring, or catchment) to storage tanks and watering troughs, where it will be available for livestock and wildlife. Polyethylene or polyvinyl chloride pipe will be buried at a depth of from




PLAN & TOPOGRAPHY




EMBANKMENT CROSS SECTION

FIGURE 6 EARTH DAM AND RESERVOIR

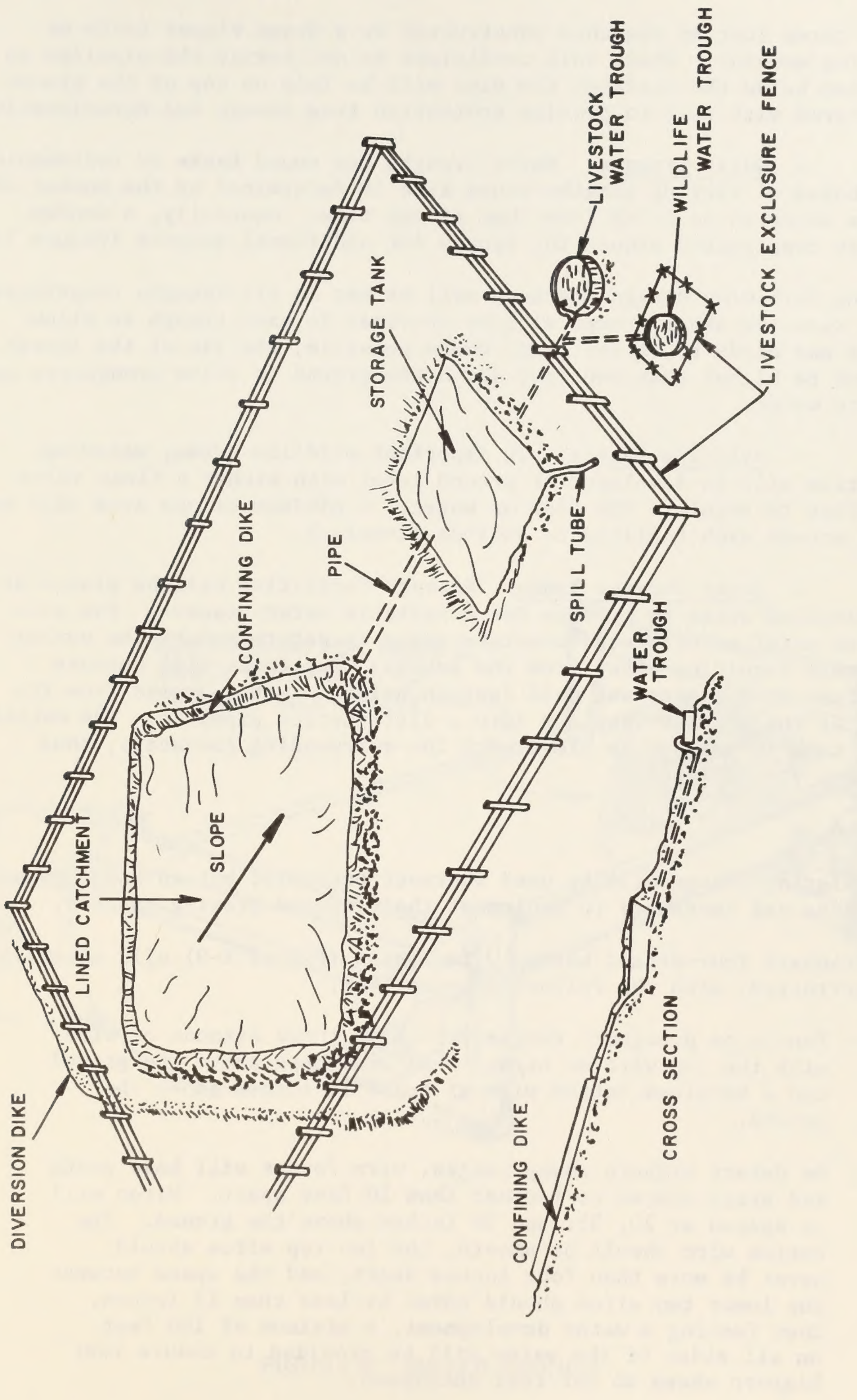



FIGURE 7 RAINFALL CATCHMENT

one to three feet in trenches constructed by a drawn ripper tooth or trenching machine. Where soil conditions do not permit the pipeline to be buried below the surface, the pipe will be laid on top of the ground and covered with soil to provide protection from damage and deterioration.

- Water Troughs. Water troughs are round tanks or rectangular metal boxes of varying lengths whose size is determined by the number of animals expected to drink from them at one time. Generally, a wooden frame is constructed around the trough for additional support (Figure I-8).

The following design features will be met on all troughs constructed in the resource area: ramps will be provided in each trough to allow animals and birds to escape; and, where possible, the lip of the trough will not be higher than two feet above the ground to allow pronghorns and fawns to water.

- Wildlife Waters. In important wildlife areas, watering facilities will be developed at ground level with either a float value or orifice to regulate the flow of water. A minimum of one acre will be fenced around each facility to exclude livestock.

- Water Storage Tanks. Storage facilities will be placed at predetermined areas to provide for a reliable water reserve. The size of these metal or plastered concrete tanks is determined by the number of animals requiring water from the source. The tanks will measure 15-30 feet in diameter and 6-12 feet in height. Water drains from the bottom of the storage facility into a distribution pipeline. The outside of the tank is painted to blend with the surrounding landscape, thus lessening visual impact.

Fences

Existing fences will be used wherever possible; but in many instances, new fences are necessary to implement the proposed grazing systems.

Standard four-strand barbed wire fences (Figure I-9) will normally be constructed, with the following exceptions;

- Fences on pronghorn ranges will have three strands of wire with the top wire no higher than 38 inches above the ground and a barbless bottom wire at least 16 inches above the ground.

- On desert bighorn sheep ranges, wire fences will have posts and stays placed no further than 10 feet apart. Wires will be spaced at 20, 35, and 39 inches above the ground. The bottom wire should be smooth, the two top wires should never be more than four inches apart, and the space between the lower two wires should never be less than 15 inches. When fencing a water development, a minimum of 100 feet on all sides of the water will be provided to ensure that bighorn sheep do not feel entrapped.

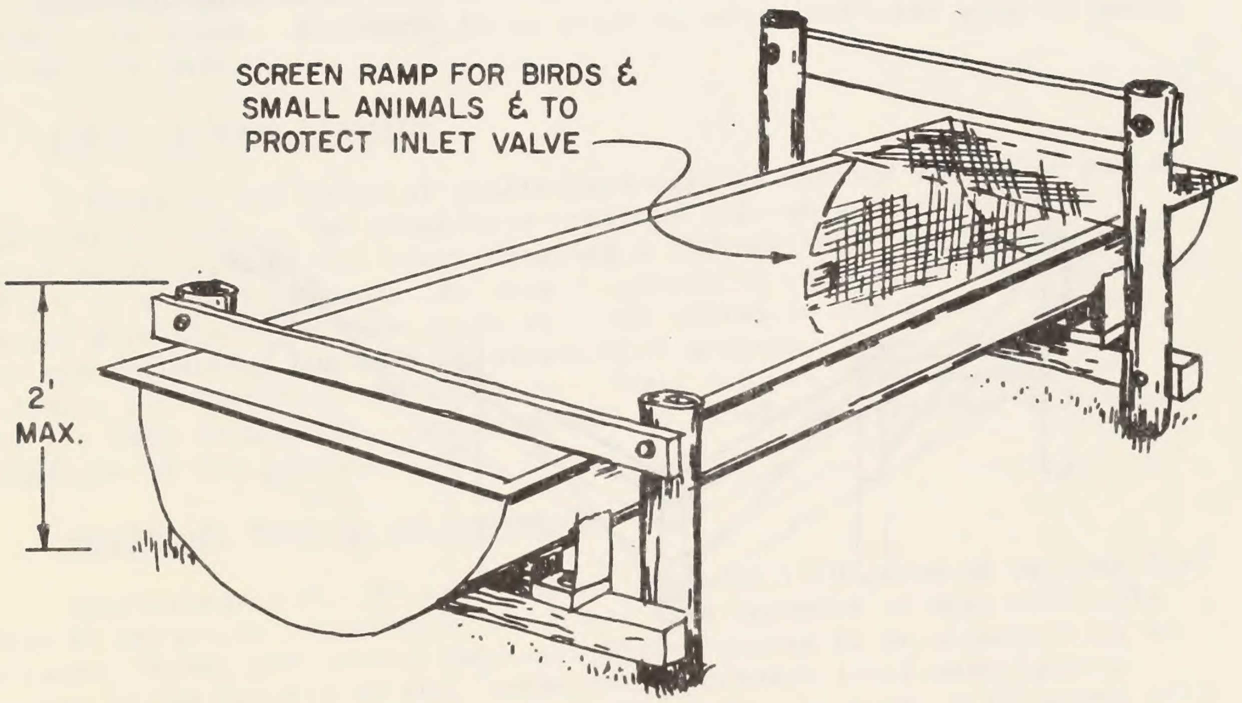
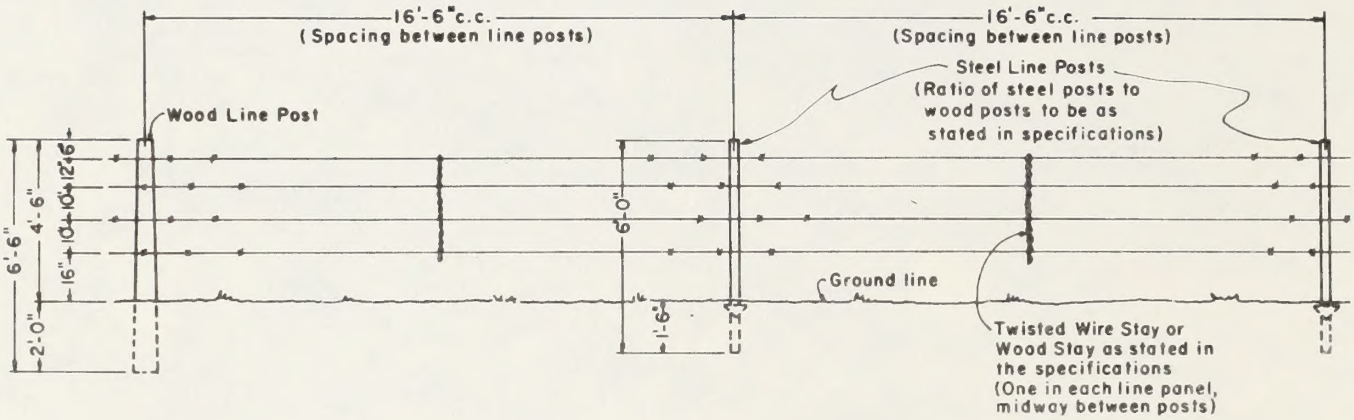
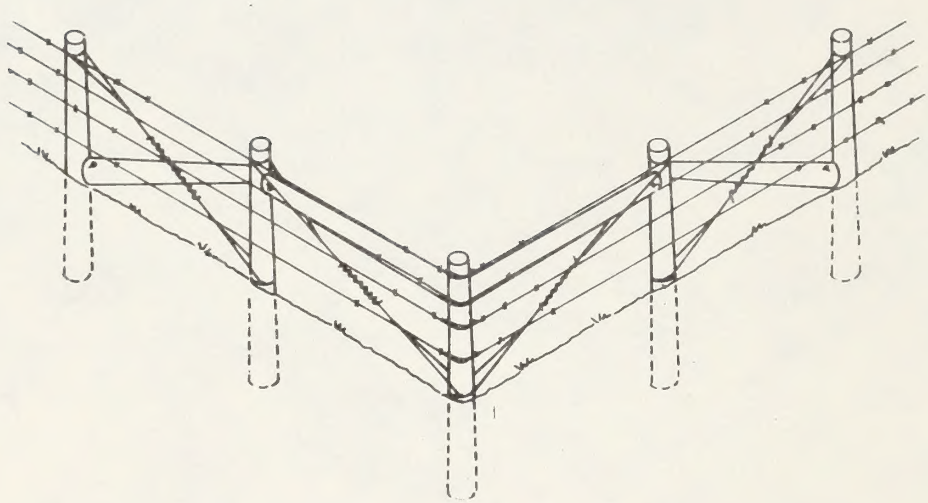



**FIGURE 8 WATER TROUGH**



PANEL AT CORNERS

FIGURE 9 STANDARD LIVESTOCK FENCE

- Fences around all livestock waters will be designed to allow access by wildlife at all times. The bottom strand of wire fences will be smooth. Maximum height of fences around stock waters will be 38 inches unless a special wildlife access provision is made.

A cattleguard or gate will be constructed in the fence at all road crossings. New fences will have at least one gate every mile and at every right angle fence corner.

Cattleguards

Cattleguards will be set on eight-by-eight inch wood timbers, precast concrete, or a poured concrete base requiring an excavation approximately 2½ feet deep by 8 feet wide and 16 feet long for single-lane roads and 32 feet long for double-lane roads. The soil will be backfilled around the base after the cattleguard grill is placed on the base.

A metal grill with openings large enough to keep animals from walking across but close enough to allow vehicles to drive over will be set onto the base to keep the grill stationary (Figure I-10). A gate will be placed to one side of the cattleguard to enable livestock to move through the fence. Extremely heavy loads or wide loads can also be taken through the gate.

Pinyon-Juniper Clearing

A total of 705 acres of public land will be chained to remove pinyon and juniper trees. Two track-type tractors will move parallel to each other about 100-200 feet apart dragging a 200-600 foot long anchor chain in a U or J configuration. An area is generally chained in two operations: in one direction, and then again at right angles to the first. Between the two operations the area is seeded with grasses, forbs, or shrubs suitable for livestock and wildlife. Exact species to be planted have not yet been determined. Seedings will be timed to correspond with rest schedules in the grazing cycle.

Blackbrush Burning and Reseeding

Approximately 800 acres of public land and 1120 acres of private land will be burned to remove blackbrush and then reseeded to more desirable grasses, forbs, and browse species. Exact species to be planted will be guided by the success of Soil Conservation Service (SCS) experimental seedings on this area initiated in 1977. Before burning, a firebreak will be cleared around the area. When weather conditions permit, fires will be set on the downwind side to burn the blackbrush. Fire-fighting equipment will be brought to the site to assure that the fire is contained within the desired area. Burning and reseeding will be timed to correspond with rest schedules in the grazing cycle.

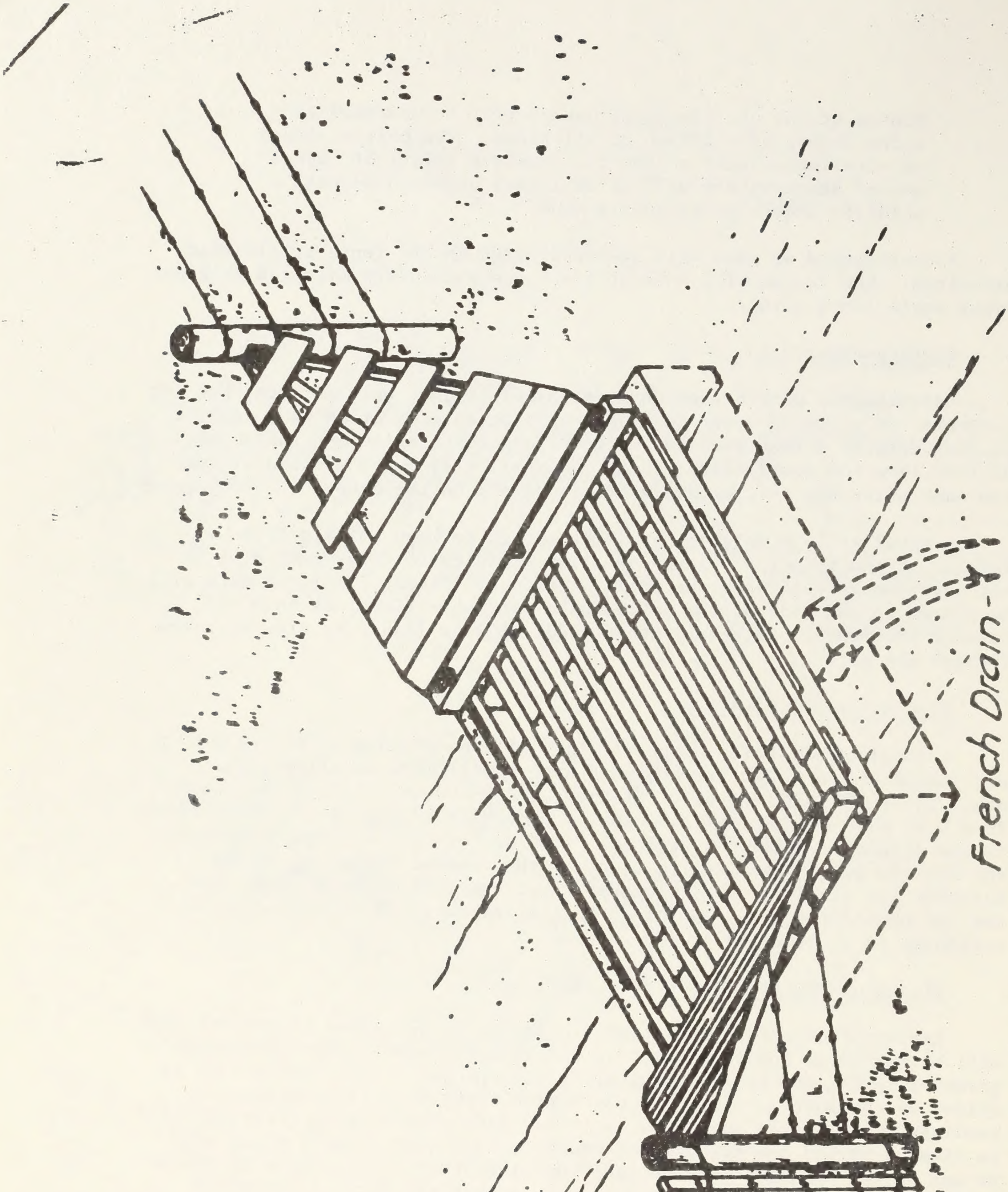



FIGURE 10 CATTLEGUARD

Corrals

Corrals are fenced areas used to hold livestock temporarily. Corral fencing will consist either of standard Type D barbed wire or wooden construction.

Access

Access to the various construction sites will not require a bladed road unless slopes or vegetation make the terrain impassable by rubber-tired vehicles. Vehicles will create a two-track trail to be used as access for construction and maintenance of the improvements. Trails will be reused from time to time because these structures must be maintained. The exact need for and location of roads/trails have not been determined. If a road or trail is determined to be required for project construction or maintenance, the environmental analysis for that range project will also include an impact analysis of the road or trail.

- Modification

Each AMP has provisions for modification upon mutual written agreement by both parties. Any significant change would require additional environmental assessment.

- Compatibility with Other Uses

The final component of each AMP is an analysis of the extent to which the proposed plan is compatible with all other uses of the public land.

The individual AMPs for the Cerbat/Black Mountain Planning Units are available for study at BLM's Kingman Resource Area office.

b. Sequence of AMP Implementation

Priorities for implementing AMPs were established on the basis of range condition, erosion condition, importance of the area for wildlife and wild horse or burro habitat, and degree of competition between livestock and wildlife, wild horses, or burros. Range, watershed, and wildlife personnel from the Kingman Resource Area rated each of the above categories according to the benefits to be derived from implementation of each AMP. If the evaluator felt that AMP implementation would be highly beneficial for a particular resource, it was rated as priority 1. If the evaluator believed that the AMP would provide fewer benefits compared to existing conditions, it was rated as priority 3. If some benefits would accrue from an AMP but implementation was not critical, it was rated as priority 2.

Each category was also weighed according to its relative importance. Range and vegetative condition was given the highest weight (five) because it is a measure of the basic resource of the land -- abundance, vigor, kinds, and distribution of vegetation. Erosion condition and wildlife habitat condition were given equal weights (two), and burro and wild horse considerations were weighed one. Table I-11 shows the results of this rating method.

Five years are being allotted for implementation of all AMPs in the Cerbat/Black Mountain ES area. Implementation of the grazing system follows sequentially one year after construction of improvements outlined in Table I-10. Authorized livestock grazing use will be adjusted to the estimated carrying capacity (see Table I-3) before or at the same time as implementation of the AMP.

Implementation of the proposed action will require additional manpower for survey and design, contract supervision, maintenance of range improvements, and AMP supervision. Figure I-11 illustrates the estimated man-month requirements for the five-year implementation period. Five additional employees will be required for scheduled implementation and maintenance of the proposed action.

2. Custodial Management

Eight allotments are managed custodially, and are included in the proposed action (Table I-12). Custodial management is employed when the percentage of public land in an allotment or pasture is small (generally less than 10%), and/or when the Federal land in the allotment or pasture is designated (by MFP decision) for transfer out of public ownership. Under custodial management the allottee is not required to follow a specified grazing system (Table I-13).

Four of these eight allotments contain a minor amount of Federal land. BLM issues grazing licenses on the basis of the estimated grazing capacity of the Federal range. The public lands are inspected periodically to prevent over-utilization, but the BLM does not otherwise attempt to control livestock numbers or seasons of use.

The other four allotments under custodial management are in areas where the public land is to be transferred to other ownership. BLM does not develop AMPs for these areas but does control numbers of livestock and seasons of use. BLM personnel inspect these allotments to guard against potential livestock grazing trespass.

In addition to the allotments where management is entirely custodial, portions of seven allotments under AMPs are managed custodially; stocking rates for these areas are shown in Table I-3.

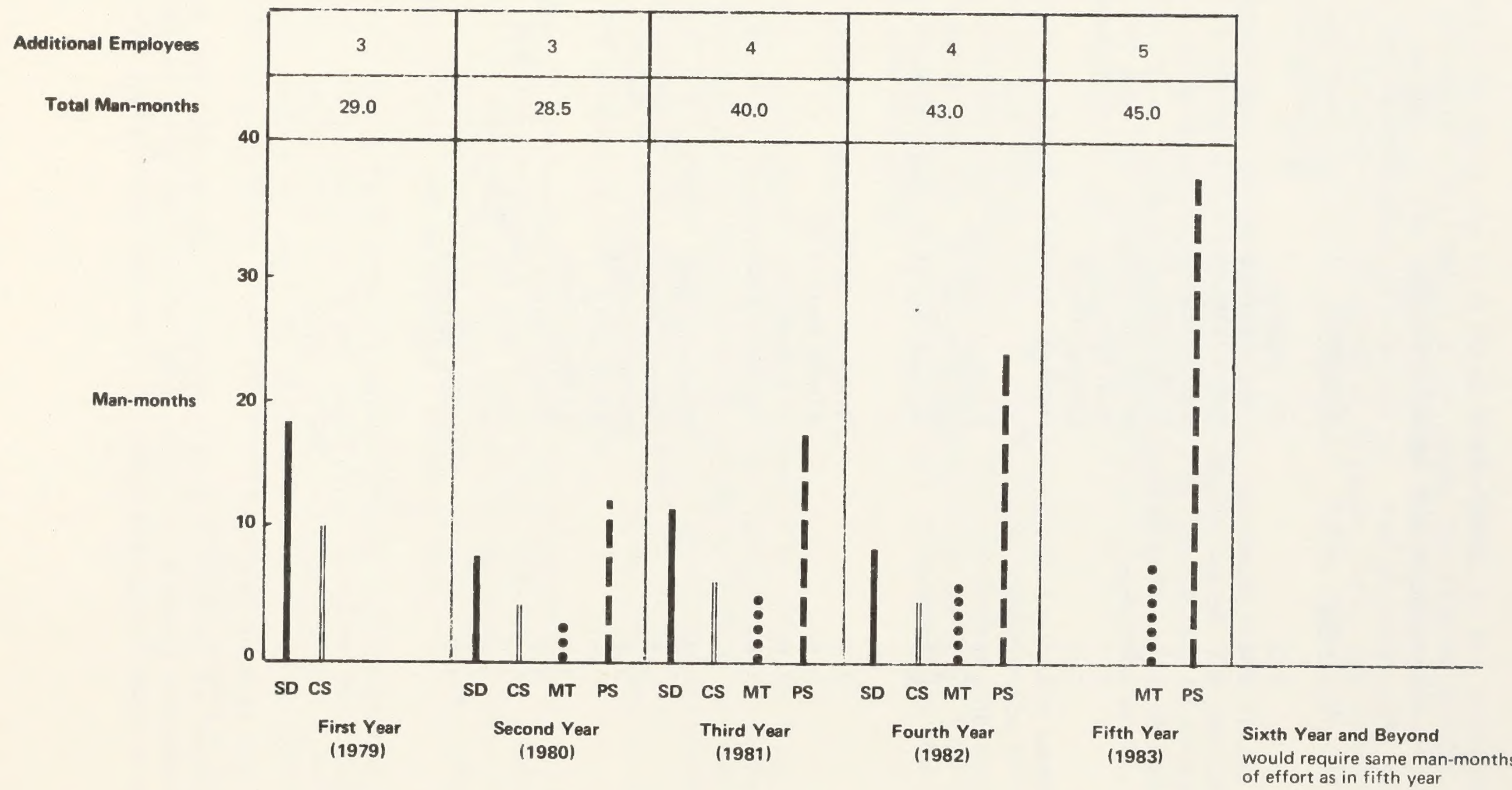
TABLE I-11

SEQUENCE OF AMP IMPLEMENTATION

| Year | Priority | Allotment |
|---|---|---|
| 2 | 1.2 | Ft. McEwen |
| | 1.4 | Cane Springs |
| | 1.5 | Mineral Park |
| | 1.6 | Castle Rock |
| | 1.7 | Gediondia |
| | 1.9 | Upper Music |
| | 1.9 | Mud Springs |
| | 2.0 | Canyon Ranch |
| | 2.1 | Diamond Bar/Gold Basin |
| 3 | 2.1 | Crozier Canyon |
| | 2.1 | Mt. Tipton |
| | 2.1 | Cerbat/Quail Springs/Turkey Track |
| 4 | 2.3 | Stockton Hill |
| | 2.6 | Black Mountain |
| | 2.6 | Big Ranch |
| | 2.8 | Truxton Canyon |
| 5 | 2.8 | Pine Springs |
| | 2.8 | Cedar Canyon |
| | 2.8 | Dolan Springs |
| | 2.8 | Hackberry |
| | 3.0 | Silver Creek |
| | 3.0 | Thumb Butte |
| | 3.0 | Portland Springs |
| | 3.0 | Curtain |
| | 3.0 | Clay Springs |

Priorities: 1.0 = highest priority
3.0 = lowest priority

Source: Bureau of Land Management.




Key:

SD = Survey and design
CS = Construction and Supervision
MT = Maintenance
PS = AMP supervision

**FIGURE I-11 MANPOWER REQUIREMENTS FOR IMPLEMENTATION AND MAINTENANCE OF PROPOSED ACTION**

TABLE I-12

ACREAGE SUMMARY OF LAND OWNERSHIP IN CUSTODIAL ALLOTMENTS

| Allotment | Public Land | Controlled Land | Uncontrolled Land | Total |
|---|---|---|---|---|
| Cook Canyon* | 3,280 | 3,000 | 1,280 | 7,560 |
| Jones Spring* | 2,370 | 765 | 13,795 | 16,930 |
| Valentine* | 3,170 | 2,499 | 261 | 5,930 |
| Walapai Ranch* | 10,794 | 18,825 | - | 29,619 |
| Subtotal | 19,614 | 25,089 | 15,336 | 60,039 |
| Feldspar** | 640 | 3,940 | | 4,580 |
| Long Mountain** | 5,144 | 37,995 | | 43,139 |
| Peacock Mountain** | 1,457 | 13,220 | | 14,677 |
| West Peacock** | 2,169 | 55,981 | | 58,150 |
| Subtotal | 9,410 | 111,136 | | 120,546 |
| Total | 29,024 | 136,225 | 15,336 | 180,585 |

*Percent of use license Federal range -- BLM does control livestock numbers.
**Licensed at 100% Federal range -- BLM does not control livestock numbers.

Source: Bureau of Land Management.

TABLE I-13

STOCKING RATES FOR CUSTODIAL ALLOTMENTS

| Allotment | Current Allowable Use | | Proposed Stocking Rate* | | Numbers Licensed on Public Land** | |
|---|---|---|---|---|---|---|
| | AUMs | Cyls | AUMs | Cyls | AUMs | Cyls |
| Livestock Numbers Controlled by BLM | | | | | | |
| Cook Canyon | 480 | 40 | 480 | 40 | N.A. | N.A. |
| Jones Spring | 108 | 9 | 108 | 9 | N.A. | N.A. |
| Valentine | 720 | 60 | 720 | 60 | N.A. | N.A. |
| Walapai Ranch | 2,832 | 236 | 2,832 | 236 | N.A. | N.A. |
| Livestock Numbers Not Controlled by BLM | | | | | | |
| Feldspar | N.A. | N.A. | N.A. | N.A. | 72 | 6 |
| Long Mountain | N.A. | N.A. | N.A. | N.A. | 480 | 40 |
| Peacock Mountain | N.A. | N.A. | N.A. | N.A. | 168 | 14 |
| West Peacock | N.A. | N.A. | N.A. | N.A. | 240 | 20 |

N.A. = Not applicable.

*Includes numbers on public land and private controlled land. Licensed at percent use on public land.
**Includes numbers on public land only. Licensed at 100% public land.

Source: Bureau of Land Management.

## D. INTERRELATIONSHIPS

### BLM Planning

The Bureau of Land Mangement's planning system was implemented in 1969. BLM planning is built on the concept of a variety of uses of each resource on public lands. The planning process identifies and analyzes competing uses of the resources, which are divided into the following categories: lands, minerals, livestock forage, wild horses and burros, woodland management, wildlife habitat, recreation, and support functions.

The planning process (Figure I-12) begins with guidance from the public, in the form of laws, departmental regulations, and policies formulated by public officials. Information on the resources and their users is gathered to prepare the Unit Resource Analysis (natural resource inventory), the Social Economic Profile, and the Planning Area Analysis (relationships between resources and their use). Public participation is solicited from informed groups and individuals. BLM prepares objectives based on the guidance and resource values and presents these proposals to the public. BLM personnel, working with the public, identify and resolve conflict. Resulting recommendations contained in the MFPs are given to the district manager who makes the resource decisions, subject to approval of the state director.

The MFP and supporting materials have many applications. They are used in the development of activity plans for grazing allotments, wildlife habitats, and recreation areas. They are guides for daily operational decisions and the basis for coordination with other governmental entities and the private sector. They are also used as an aid in preparing environmental studies.

As noted earlier, the MFPs for the Cerbat and Black Mountain Planning Units were completed in 1974 and 1975, respectively. The proposed action as described in this ES represents the implementation of activity plans (AMPs) for management of domestic livestock grazing in these two planning units.

AMPs were developed in compliance with MFP decisions listed in Table I-14. MFP decisions considered relevant to and/or influential to development of the proposed action are shown in Figure I-13. Complete MFPs for both planning units can be obtained from the Phoenix District or Kingman Resource Area offices.

The interrelationship of the proposed action with existing or proposed Federal, state, and local governmental projects, plans, and policies is discussed in Chapter II-B13, Institutional Setting.

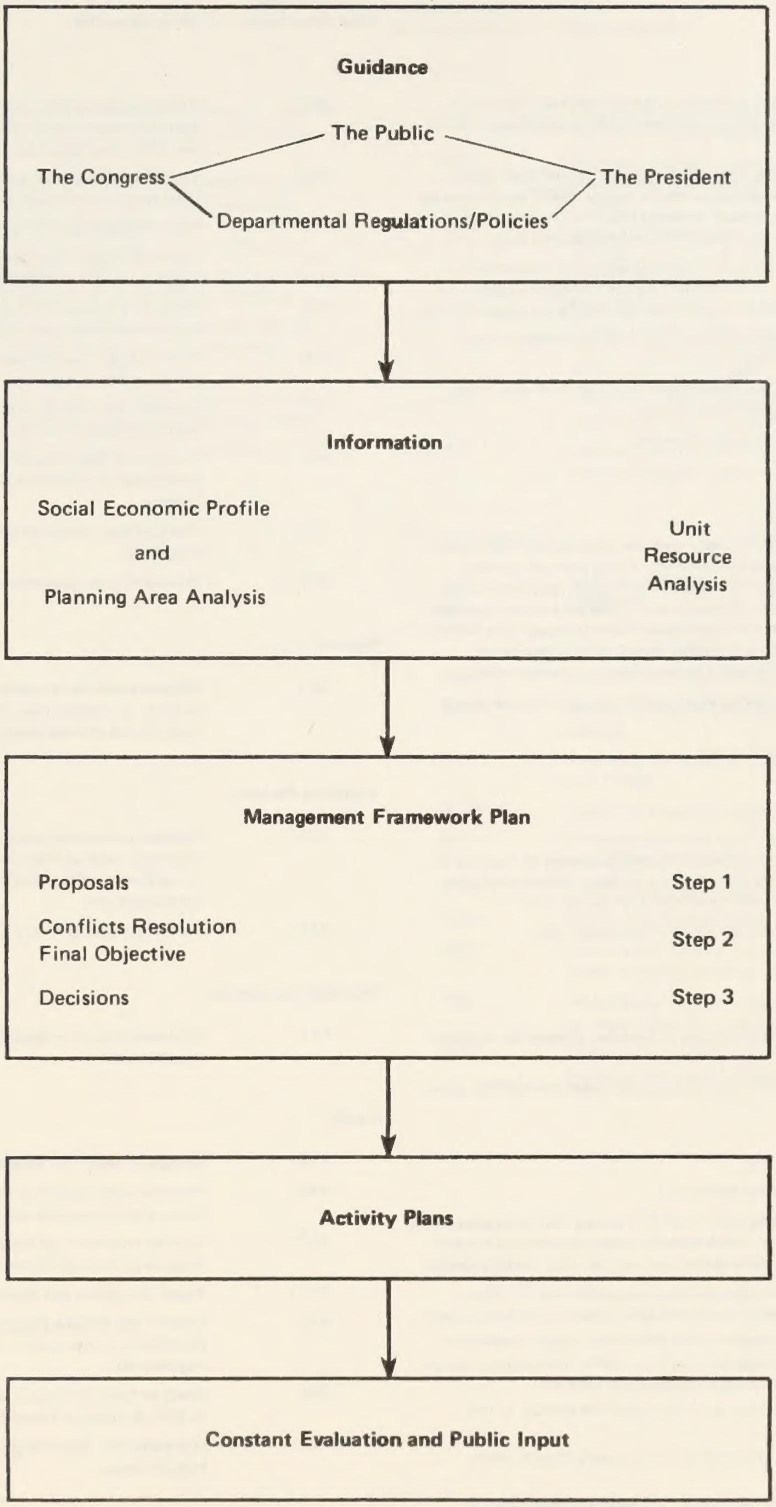



**FIGURE I-12 BLM PLANNING PROCESS**

TABLE I-14

MANAGEMENT FRAMEWORK PLAN DECISIONS

| Resource and Recommendation | Cerbat Mountains |
|---|---|
| Lands | |
| R1* | Retain public lands within specified areas and acquire through exchange remaining private and state lands to consolidate Federal ownership. |
| R2* | Dispose of lands with little or no multiple-use and open space values. Designate specific parcels for future R&PP[a] acquisition by local governments. Cancel exchange classification on parcels of public land for the Lake Mead National Recreation Area. |
| R3 | Issue no communication site rights-of-way until completion of a unit-wide study and formulation of a communications plan. Do not allow sites in natural scenic areas or wildlife management areas. |
| R4 | Establish right-of-way corridors for major transmission lines, pipelines, and highways. |
| R5 | Public Purpose lands – cancel withdrawal for lands within the Lake Mead National Recreation Area. |
| R6 | Revoke temporary wildlife agreement. |
| Minerals | |
| R7 | Consider minerals the primary resource value on identified lands and restrict other uses that conflict. Allow livestock grazing, utilization of wildlife habitat by wildlife, open space recreation, fence post and firewood harvest, and Yucca sales where specified. These uses should not conflict with minerals management in these areas. No expenditure of Federal funds will be allowed for resource projects that could be destroyed by mineral operations. |
| R8 | Retain lands for future sand and gravel sales and free use permit sites. |
| R9 | Develop salt mineral leasing. |
| Vegetative Products | |
| R10 | Allow no commercial harvest of woodland species and no free or commercial Christmas tree harvest unit-wide. Allow fence post cuttings and dead firewood gathering for family use. |
| R11 | Allow commercial sale of Yucca in designated areas. |
| Range Management | |
| R12* | Initiate pinyon-juniper thinning and seeding projects on identified lands. |
| R13 | Develop water control dams and spreader dikes on retention areas. |
| Wildlife | |
| R14* | Complete HMPs for the entire unit. |
| R15 | Improve water distribution for wildlife through spring developments and well installations. Make livestock waters available to wildlife yearlong. Develop water catchment sites for small wildlife species. |
| R16* | Implement AMPs on retention lands except for the Mt. Wilson wildlife management area where livestock grazing will be excluded.<br>Evaluate big game, livestock, and wild burro forage competition.<br>Reserve adequate forage for wildlife in AMPs. Eliminate or reduce forage competition between big game and livestock.<br>Identify and protect rare, endangered, and threatened species habitat.<br>Do not allow range improvements that would interfere with pronghorn habitat.<br>Acquire nonpublic lands through exchange and retain certain public lands.<br>Acquire and maintain legal access on designated lands.<br>Do not allow issuance of special land use permits, free use permits, or new road developments in critical deer habitat areas.<br>Prohibit introduction of exotic big game species without thorough analysis and concurrence with Arizona Game and Fish Department.<br>Allow predator control on a case-by-case basis. |

| Resource and Recommendation | Black Mountains |
|---|---|
| Lands | |
| R1* | Retain needed public lands within the unit and acquire through exchange remaining private and state lands to consolidate Federal ownership to support future activity plans. |
| R2* | Dispose of designated public lands through exchange, state indemnity lieu selection, and R&PP. |
| R3 | Reserve public land for future R&PP acquisition by Mohave County. |
| R4 | Cancel the Lake Mead National Recreation Area exchange classification for an isolated parcel of land. |
| R5 | Set aside a scenic belt of land along U.S. Highway 66 on the south end of the unit as a corridor and buffer zone. |
| R6 | Confine major rights-of-way for EHV[b] transmission lines, highways, and pipelines to identified corridors. |
| R7 | Establish two areas as potential communication sites and allow future applications only in these areas. |
| R8 | Revoke two major withdrawals in the unit: (1) temporary withdrawal for classification and (2) Colorado River Storage Project. |
| R9 | Conduct field studies to assess unauthorized uses and extent of occupancy. |
| R10 | Reserve for state selection/exchange. |
| Minerals | |
| R11 | Designate and retain public lands for future sand and gravel sales and free use permit sites. Keep public lands open to mining location and mineral leasing. |
| Vegetative Products | |
| R12 | Prohibit commercial sale or the free permit harvesting of juniper tree fence posts or Christmas trees in the unit. Use of other legal native plants – allow local government and nonprofit association landscaping use. |
| R13 | Provide for sale of Yucca in management areas. |
| Watershed Management | |
| R14 | Construct detention dams for erosion and water control on retention areas. |
| Wildlife | |
| R15* | Complete HMPs[c] for retention lands within the entire unit. |
| R16* | Develop water sources at higher elevations for desert bighorns and fence to exclude cattle and burros. |
| R17* | Develop water sources suitable for small and nongame species and fence to exclude cattle and burros. |
| R18 | Fence Columbine and Master Springs to exclude burros. |
| R19 | Contact the Arizona Highway Department concerning the placement of road signs to help prevent bighorn kills on Highway 68. |
| R20 | Cover or fence the cistern in the northwest quarter, Section 27, T. 21N, R. 20W, to prevent desert bighorn sheep drownings. |
| R21* | Designate the "Black Mountain wildlife management area" for bighorn sheep. |

TABLE I-14 (Continued)

| Resource and Recommendation | Cerbat Mountains |
|---|---|
| Recreation | |
| R17 | Inventory archaeological sites within the planning unit. Identify existing public hazards, particularly emphasizing open mine shafts. |
| R18* | North Music Mountains natural scenic area: acquire all private lands to the north through land exchange and designate as a natural area. Restrict ORVs[d], to existing roads, trails, and washes. Develop a recreation management plan. Assure public access. |
| R19* | Consolidate land ownership within the Clay Springs Canyon area. Designate the area as natural and scenic. Restrict ORV use. |
| R20* | Continue BLM administration of the Pack Saddle and Windy Point recreation sites and designate as natural scenic area. Restrict ORV use. |
| R21* | Consolidate land ownership within the Mt. Tipton natural scenic area to block ownership and retain for management purposes. |
| R22* | Restrict ORV use to designated roads, trails, and washes. |

| Resource and Recommendation | Black Mountains |
|---|---|
| Recreation | |
| R22 | Conduct an archaeological site inventory of the planning unit and develop an archaeological protection program. |
| R23 | Inventory all public hazards, giving particular emphasis to open mine shafts. Subsequently develop and implement a protection program. |
| R24 | Assure access for public use and enjoyment of outdoor recreation values on public lands through existing roads and trails. Sign and post access roads to provide public information. |
| R25* | Restrict ORV use to designated roads, trails, and washes in designated areas (Black Mountains wildlife management area) of the unit. That portion of the unit outside the restricted area will be left open to ORV use. |
| R26 | Initiate a plan for minimal development of two visitor overlook sites in the Tri-state Viewpoint area. |
| R27 | Conduct a study to determine if Boundary Cone qualifies as a national (geologic) landmark. |
| Range Management | |
| R28 | Establish grazing systems on these lands to be retained in public ownership. |
| R29* | Boundary Cone and Warm Springs units where all forage will be reserved for wildlife. |
| R30* | Areas to be managed without wild free-roaming horses and burros. |
| R31* | Remove unbranded and unclaimed horses or burros as trespass animals. |
| R32* | Reserve 2,400 unit-months of forage for wild free-roaming horses and burros. |
| R33* | Reduce the burro population to 200 animals. |
| R34* | Develop additional water (for burros) as needed and coordinate with other activities. |
| R35* | Close certain areas to grazing by domestic horses and burros. |
| R36* | Retain public lands within the (burro) habitat area. |
| R37* | Retain rights-of-way along wash channels for burro access on lands removed from public ownership. |
| R38* | Acquire key tracts or rights-of-way for burros down wash bottoms, or water rights for burro use from key tracts. |
| R39 | Enter into cooperative agreements with NPS[e] and FWS[f] (to provide protection and use of waters for burros). |

*MFP decision identified in Figure I-13.

a. R&PP = Recreation and Public Purposes Act.
b. EHV = Electric high voltage.
c. HMP = Habitat management plan.
d. ORV = Off-road vehicle.
e. NPS = National Park Service.
f. FWS = U.S. Fish and Wildlife Service.

**Source:** Bureau of Land Management.

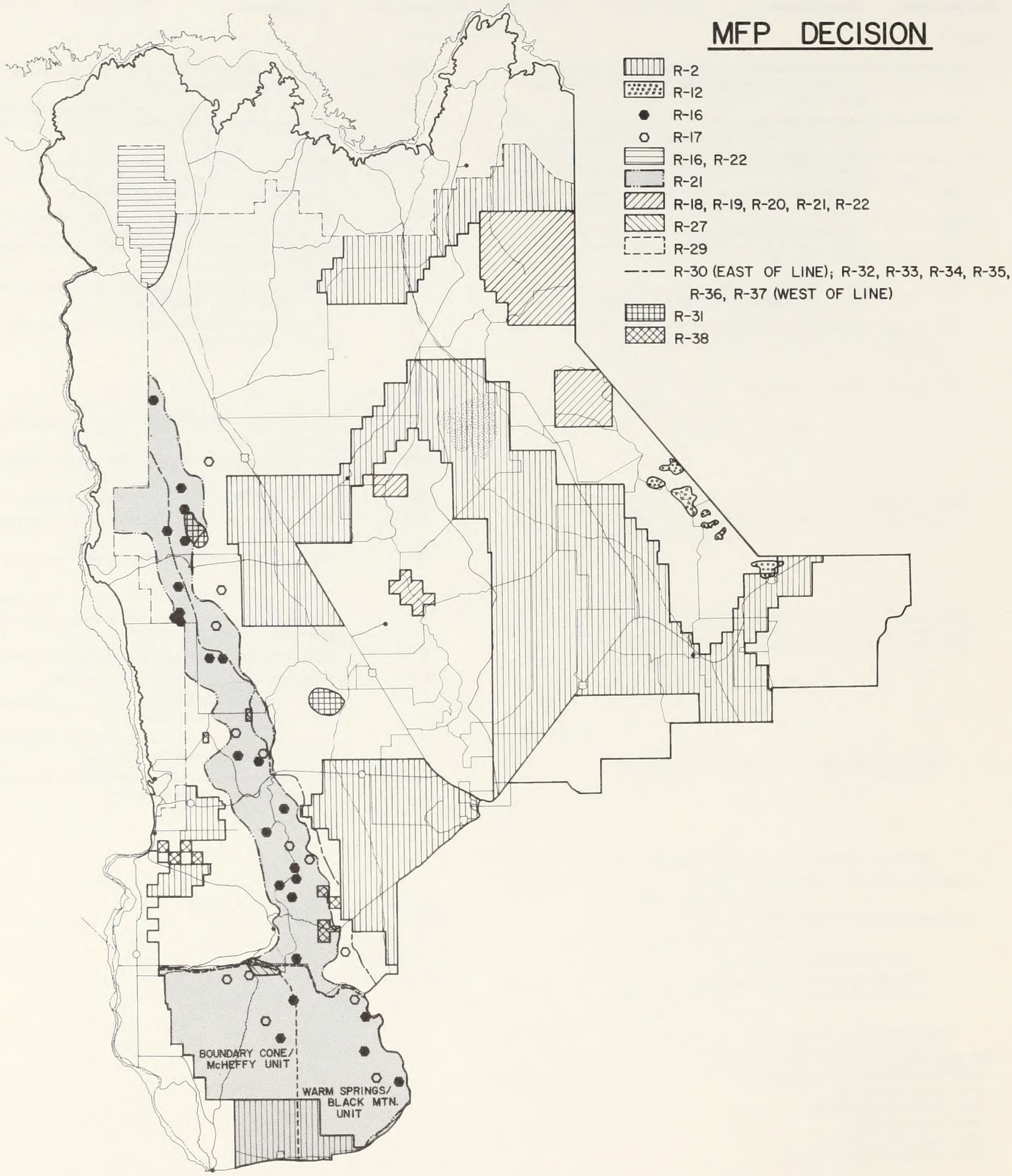



**FIGURE I-13 MFP DECISIONS**

## REFERENCES TO CHAPTER I


1. S. Clark Martin, Stocking Strategies and Net Cattle Sales on Semidesert Range. U.S. Department of Agriculture, Forest Service Research Paper RM-146, 1975.

2. Stoddart, Smith, and Box, Range Management, McGraw-Hill, 1975.

3. S. Clark Martin, "Responses of Semidesert Grasses to Seasonal Rest," Journal of Range Management, May 1973.

4. S. Clark Martin and G. Reynolds Hudson, "The Santa Rita Experimental Range," Arizona Academy of Science, June 1973.

5. Patrick O. Roerdon and Leo B. Merrill, "Vegetative Response Under Various Grazing Management Systems in the Edwards Plateau of Texas," Journal of Range Management, 1976.

6. August L. Hormay, Principles of Rest-Rotation Grazing and Multiple Use Land Management, U.S. Department of the Interior, Bureau of Land Management, U.S. Department of Agriculture, Forest Service, TT-4, 2200, September 1970.

7. Arizona Revised Statute, Title 24, Chapter 2, Article 2, Sections 24-239.

# II. DESCRIPTION OF THE ENVIRONMENT

## A. INTRODUCTION

This chapter describes the current environment of the ES area. The environment is discussed in terms of 13 elements or resources: climate and air quality, geology and topography, soils, water resources, vegetation, animals, land use (including recreation, agriculture, livestock grazing, mineral resources, forest resources, and transportation network), natural hazards, cultural resources (archaeological and historical), natural environmental areas (natural areas, natural scenic areas, areas with primitive values, wilderness areas, and areas of critical environmental concern), visual resources, socioeconomic conditions (demographics, local and regional economics, livestock grazing, government revenues, social support facilities and services for the local and ranch communities, and social well-being), and institutions. The degree of detail in the description of each resource and land use relates directly to the degree of anticipated impacts.

The concluding section of this chapter (Section C) describes the anticipated future environment if the proposed action is not implemented and the stocking levels are not reduced.

While the focus of this chapter is on the ES area, it must also address the relationship of the area to its larger environs such as Mohave County and the State of Arizona. The following description, therefore, is not limited to the ES area, as these outside linkages in some instances strongly influence local conditions or are used for comparative purposes.

## B. PRESENT ENVIRONMENT AND CONDITIONS

### 1. Climate and Air Quality

#### a. Climatic Setting

The climate of the ES area is generally warm, dry, and windy. From the available data and an understanding of the interaction of weather factors, as described in Appendix B, it can be seen that climatic conditions vary in response to the rather abrupt changes in elevation that occur in the northwestern corner of Arizona. Accordingly, the climatic factors of winds, temperature, precipitation, and growing season (a product of the other factors) are described in summary form in Table II-1 under the headings of the two major land features: valleys and mountains. Valleys are defined here as elevations under 3000 feet, and mountains as over 4000 feet; the transitional foothill areas, between 3000 and 4000 feet, have generally intermediate climate. (See Figure II-1.)

Because of a paucity of data, valley and mountain climates were characterized by extrapolation from a few representative stations both inside and immediately outside the ES area. These stations, shown with study area boundaries, are depicted in Figure II-2. While most parts of the ES area fall within valley or mountain climatic types, the saddle area around Kingman bridging the Cerbat and Hualapai mountains is a special case, with intermediate temperatures, strong southwest winds, and rainfall which is slightly higher than valley floor rainfall, but unpredictable.

The moderate, moist winters of the ES area contrast with the windy springs and especially with the immoderate summers; the summer heat and lack of rain (until late summer thundershowers) lead to very low humidity, sandstorms, and dust veils, and cut off the spring growing season. Since the short, violent rainstorms and flash floods of late summer provide very little groundwater percolation, winter rains and light, melting snows are the primary sources of moisture. Vegetation in this area must therefore be adapted to arid and semi-arid conditions. The historical trend in precipitation is shown in Figure II-3 and normal annual precipitation is shown in Figure II-4.

#### b. Air Quality

The only portion of the ES area experiencing relatively frequent stagnant air and trapped pollutants is the low elevation strip along the Colorado River. Otherwise, high winds generally effectively disperse and dilute gaseous pollutants, but also transport particulate matter. Therefore, periodically high particulate loading is the primary air quality problem in the ES area, rather than high levels of pollutants, such as sulfur or nitrogen oxides, from point sources or vehicles.

TABLE II-1

SUMMARY OF CLIMATIC CHARACTERISTICS - ES AREA

| Climatic Factor | | Valleys | Mountains |
|---|---|---|---|
| Prevailing Winds | Seasonal | Summer: Southerly, 7-10 kt<br>Winter: Northerly, 10-20 kt<br>Spring dust storms<br>Summer updrafts (dust devils) | Winds not as clearly channeled, not as strong as in valleys; more data necessary to describe |
| | Diurnal | Morning: Moderate speeds; directions aligned with valley axis (N-S)<br>Afternoon: Stronger, more turbulent; direction more varied (N, S, W) | Air flows up slopes in morning, down slopes in evening |
| Temperature | Seasonal | Summer: 85-90°<br>Winter: 40-50° | Summer: 70-80°<br>Winter: 30-40° |
| | Geographic | Valleys closest to Colorado River are hottest | Temperature correlated with elevation: Cerbat Mountains cooler than Black Mountains |
| | Growing Season | 220-280 frost-free days | 200-220 frost-free days |
| Precipitation | Annual | 3-10 inches/year rain | 10-14 inches/year rain and snow |
| | Seasonal | Summer: Intense thunderstorms<br>Early fall: Low penetration (high runoff)<br>Winter, early spring: Mild rains, high penetration (low runoff) | |

Source: National Oceanic and Atmospheric Administration, Climatological Data 1975, Annual Summary for Arizona.

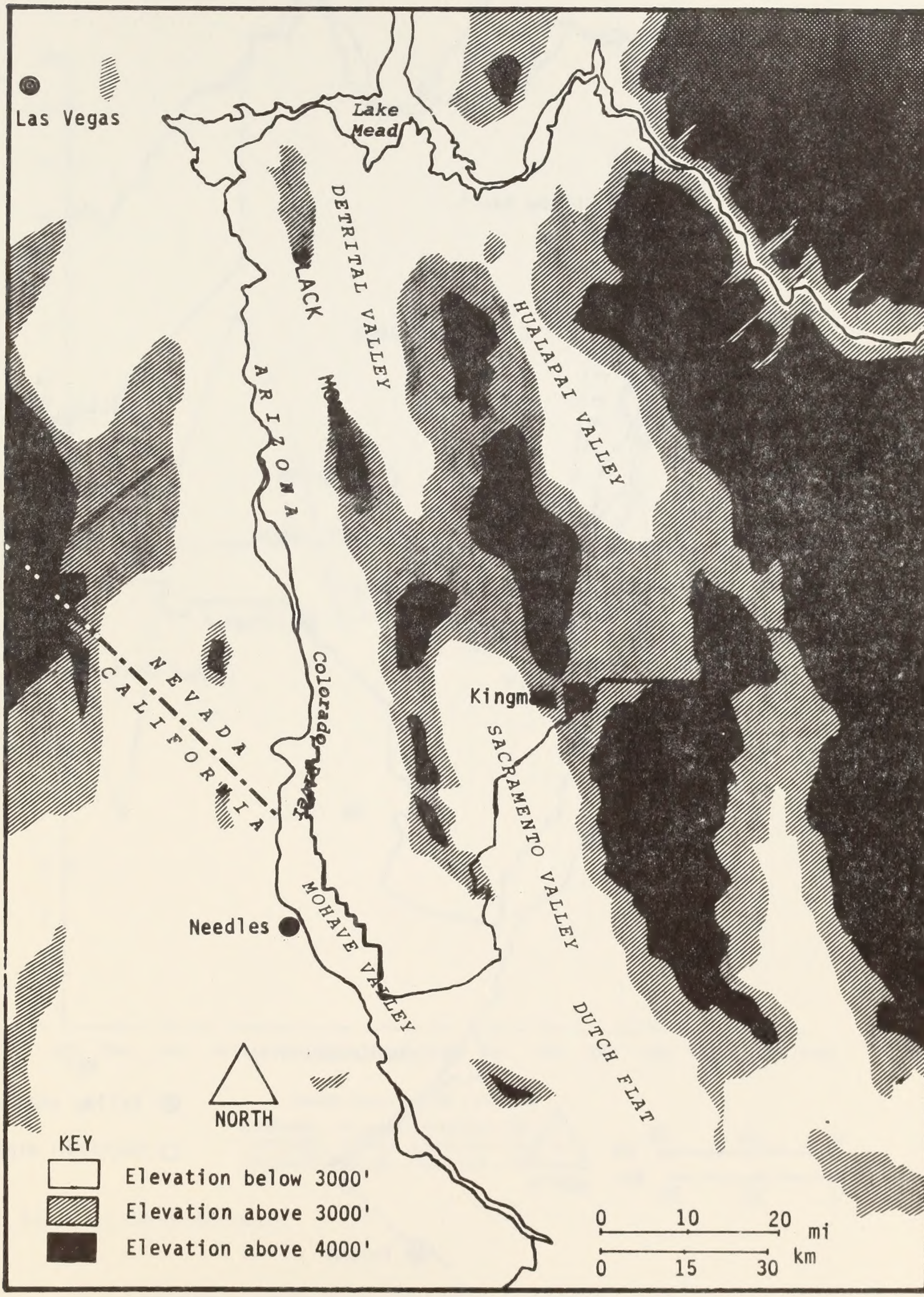



FIGURE II-1 REGIONAL TOPOGRAPHY

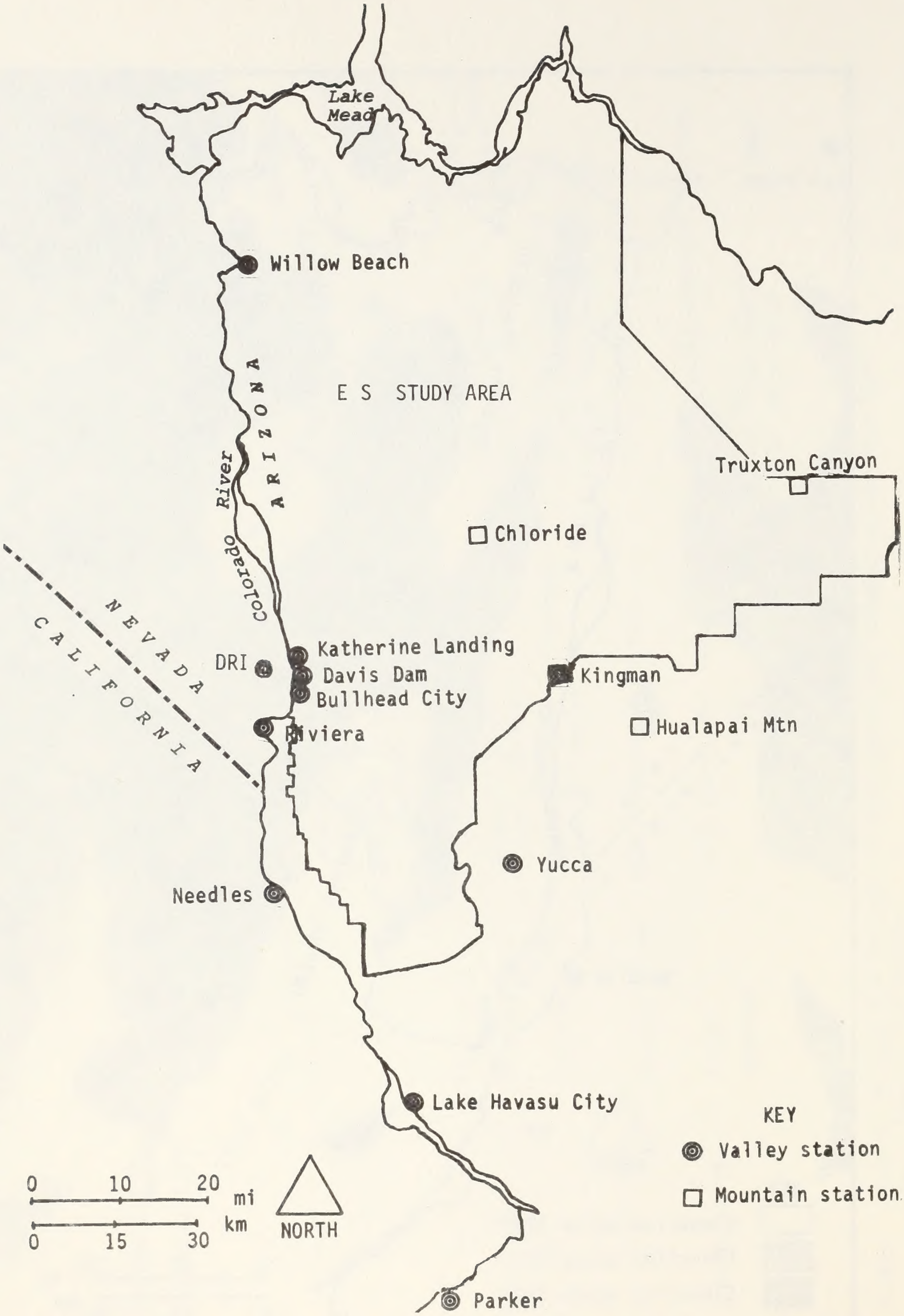
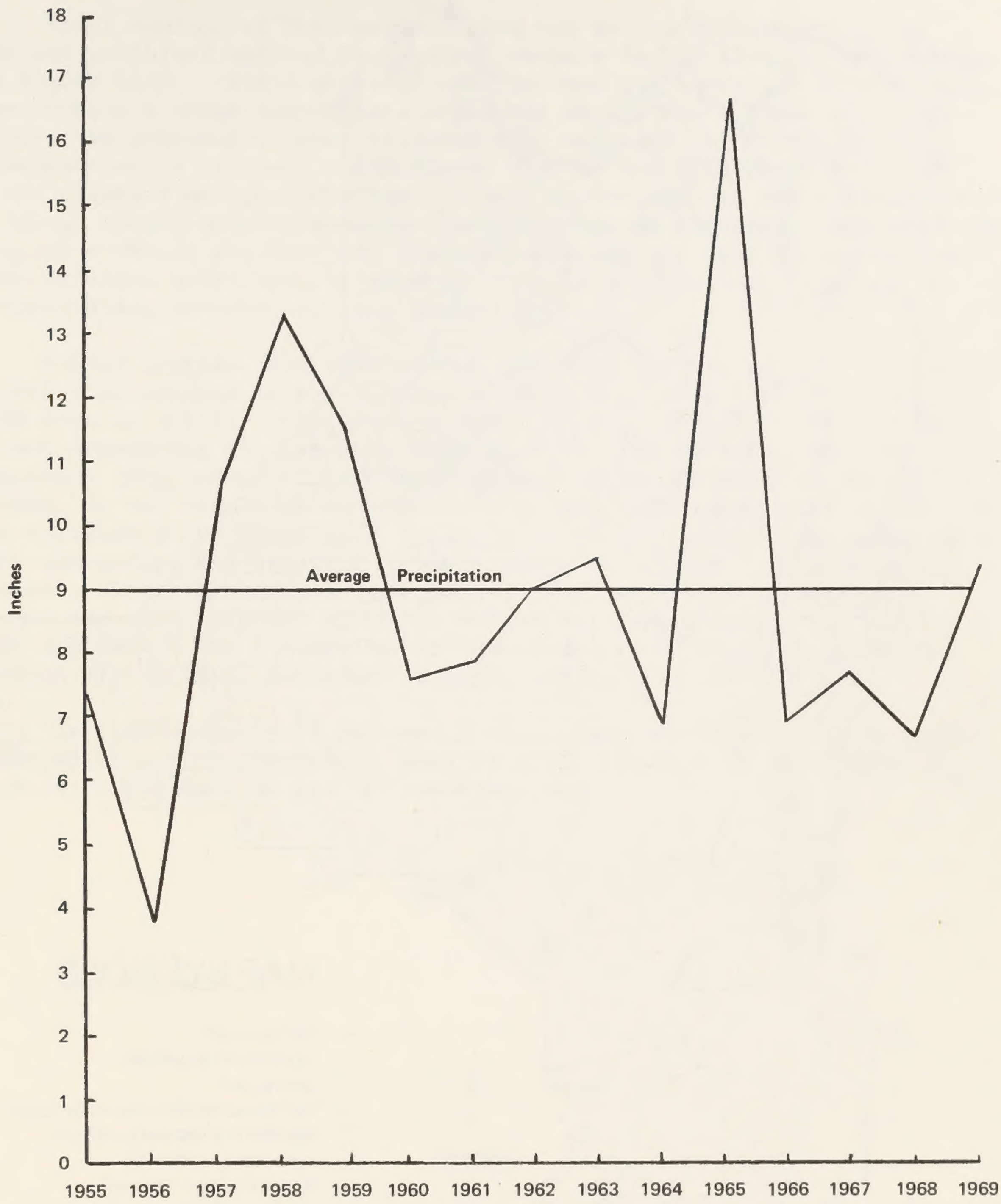



FIGURE II-2 LOCATION OF VALLEY AND MOUNTAIN WEATHER STATIONS AND AIR QUALITY MONITORING STATIONS

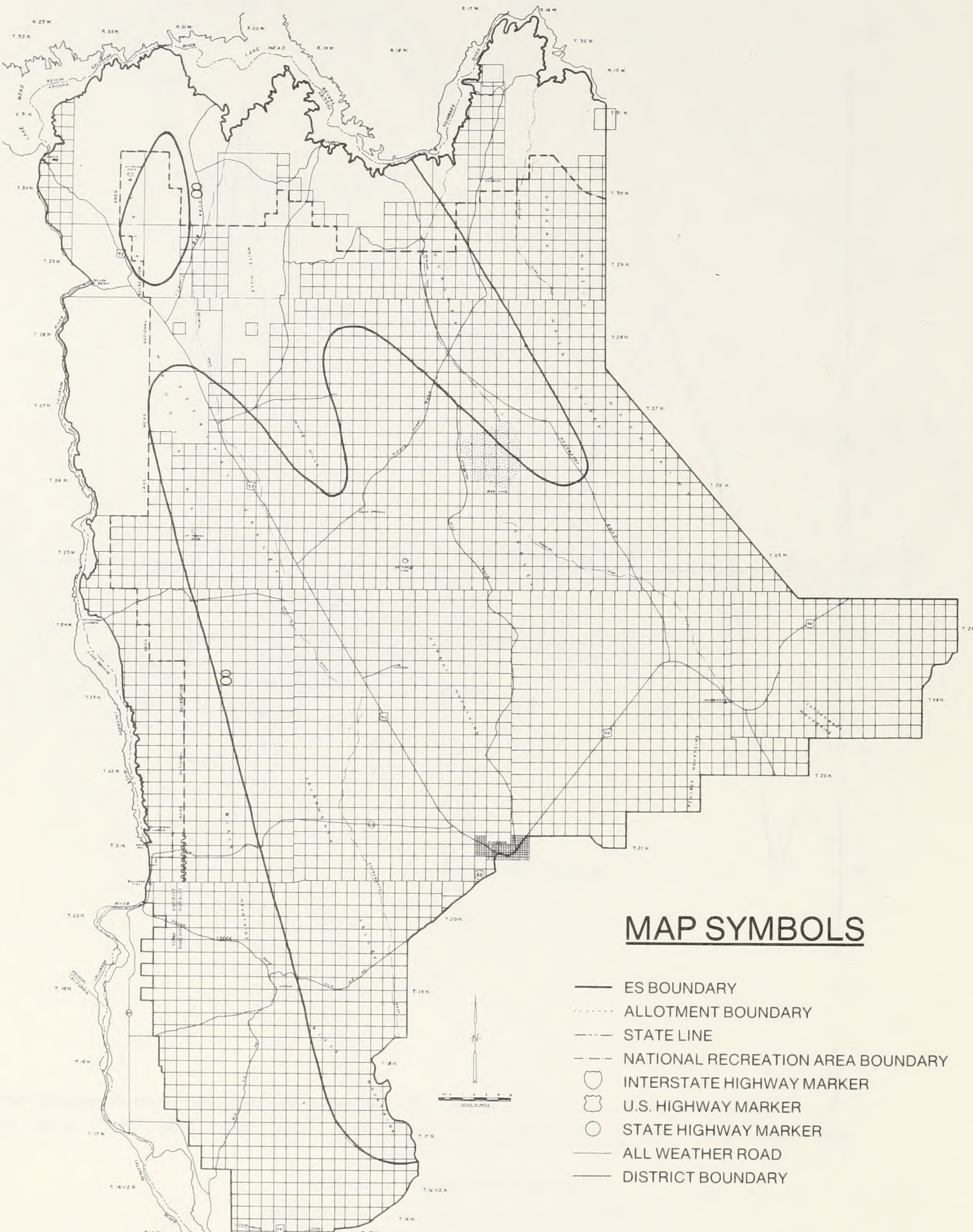



**Average Yearly Rainfall – Kingman**

1930-1950 – Average 11.44 Inches – 20 Years
1950-1960 – Average 9.68 Inches – 10 Years
1960-1970 – Average 8.95 Inches – 10 Years

**Source:** BLM Unit Resource Analysis.

**FIGURE II-3 AVERAGE YEARLY RAINFALL AT KINGMAN – 1955-69**



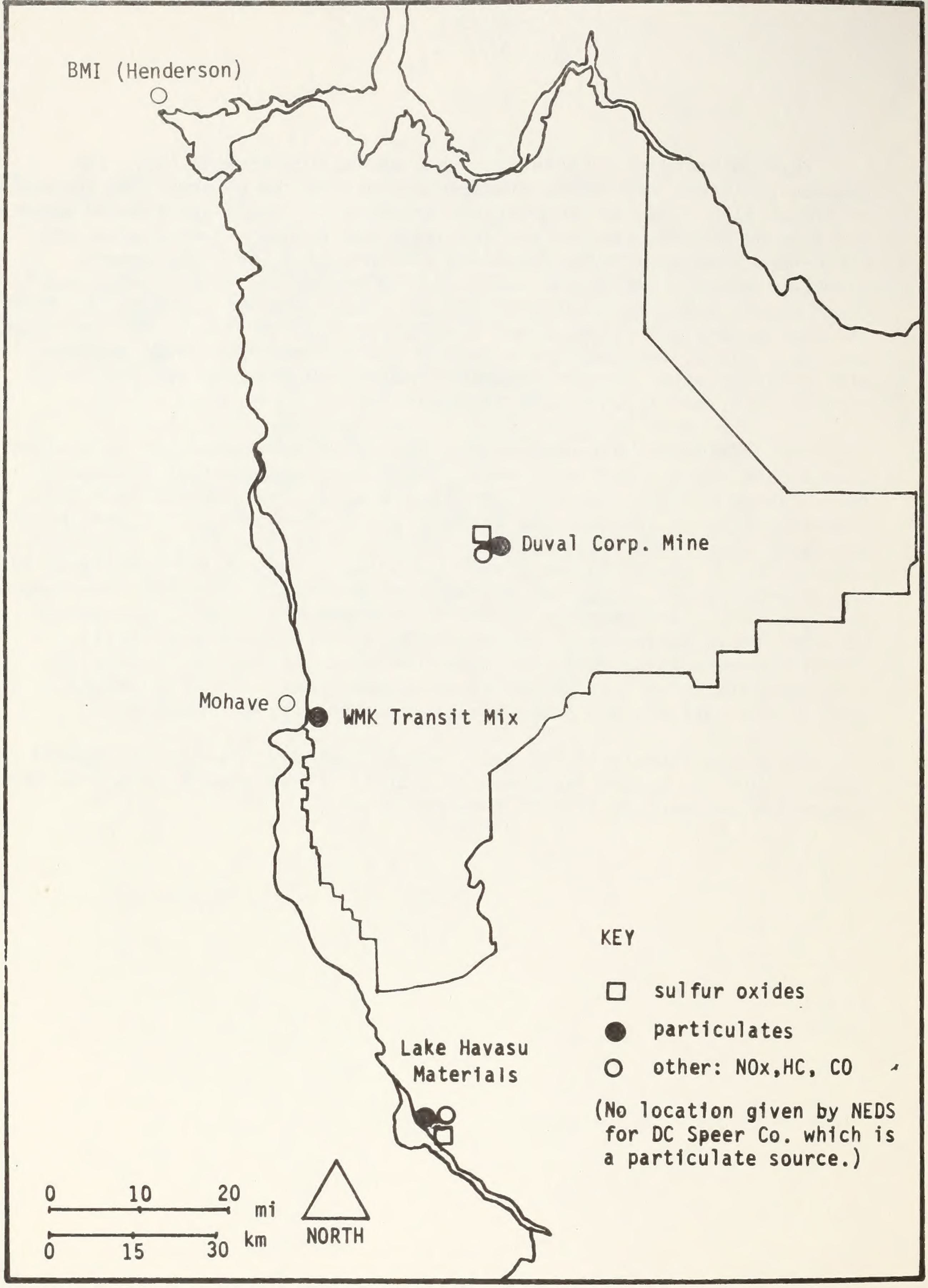

NORMAL ANNUAL PRECIPITATION
(Inches)

**FIGURE II-4 NORMAL ANNUAL PRECIPITATION – ES STUDY AREA**

Point sources of both particulates and sulfur dioxide ($SO_2$, the gaseous pollutant emitted in greatest amounts in the ES area) are located on Figure II-5. While all stations exceeded the state and Federal maximum 24-hour average particulate standards due to dust storms and other short-term phenomena, three stations also exceeded the state annual geometric mean: Riviera and Bullhead City exceed both the Federal and state standard due to local recreational activities and (at Riviera) recent tilling; mining operations cause the violation at Chloride. For the study area as a whole, the existing levels of grazing and dirt roads together with existing point sources generate roughly 500,000 tons per year of particulates, mostly dust (see Table III-2).

Sulfur dioxide, nitrogen oxides, and hydrocarbons are not emitted in significant amounts in the ES area. Existing emissions such as gasses from highway traffic, the $SO_2$ from Duval Mine at Chloride and from the Mohave Generating Station near Bullhead City, and a mixture of industrial emissions ($SO_2$, metal oxide particulates, others) from BMI at Henderson, Nevada, do not result in standards violations. Temperature inversions in the Colorado River trough and strong northwesterly winds cause some temporary channeling and trapping of these emissions within the river strip; however, these phenomena do not generally affect the ES area proper except for rare episodes of BMI emissions entering the Detrital Valley. (See Appendix B for tabulations of standards, point source emissions, ambient air quality, and other specific air quality information.)

There are roughly 15,000 vehicle-miles per day traveled on unpaved roads within the Cerbat/Black Mountain area. These lead to a particulate generation estimate of 100,710 tons per year.




Source: Arizona Department of Health Services, Bureau of Air Quality Control, National Emissions Data System printout of point and area sources in Mohave County.

FIGURE II-5 LOCATION OF POINT SOURCES OF PARTICULATES AND SULFUR OXIDES

## 2. Geology and Topography*

### a. Geologic History

The geologic history of the project area can be briefly summarized by the following events:

- Deposition of sediments and metamorphosis of volcanics into crystalline rocks -- Precambrian era (prior to 1.8 billions years ago).

- Erosion, further uplift and erosion -- Precambrian era (1.8 billion to 0.5 billion years ago)

- Deposition of marine and continental sediments -- Paleozoic and Mesozoic eras (500 million to 60 million years ago). Area with little relief and near sea level.

- Uplift and subsequent formation of block fault mountains; followed by periodic erosion, uplift, intrusion, volcanics, and deposition of basin sediment -- 60 million years to present Cenozoic era.

Rock types exposed in the study area range from Precambrian crystalline granites and gneisses to Tertiary sediments. The Precambrian granites are exposed primarily in the lower portions of the southern Grand Wash Cliffs and the Cerbat Mountains. There are also minor exposures in the Black Mountains. The Precambrian granites have been intruded by a gray biotite granite and, in some localities, by dikes of diabase.[1] The southern two-thirds of the Cerbat Mountains are composed mostly of Precambrian granite, granite gneisses, quartzite, mica schist, hornblende diopside schist, amphibolite, and some dioritic gneisses. These same Precambrian rock types are also exposed in the lower half of the Black Mountains.[2]

Paleozoic rocks in the study area are confined to the upper portion of the Grand Wash Cliffs and they overlie the Precambrian crystalline complex. One small locality of Paleozoic rocks is exposed north of Mt. Tipton near Dolan Springs. No Paleozoic rocks are noted elsewhere in the study area.

The Paleozoic rocks are largely marine sediments with some interbedded layers of sand and shale. The Cambrian system is well represented along the Grand Wash Cliffs and comprises the only Paleozoic rocks in the northern Cerbat Mountains. The coarse-grained tapeats sandstone is the basal unit of the Cambrian system and overlies the Precambrian rocks. Bright angel shale forms a slope nearly 400 feet thick and overlies the tapeats. The marine limestones and dolomites of the Mauv limestone form impressive cliffs above the bright angel shale and represent the last of the Cambrian rocks

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*References for this subsection follow on page II-235.

exposed. The Mauv limestone forms the top of the Grand Wash Cliffs in the southern portion. Above the Mauv rest 450 feet of the temple butte formation of Devonian age composed mainly of dolomites. Redwall limestone of Mississippian age forms the upper cliffs of the Grand Wash Cliffs in the northern portion.[3]

During Mesozoic time[4] or Tertiary time[5] many of the Precambrian crystalline rocks were intruded by granitic rocks. The Ithica peak granite is considered of this age. Hydrothermal mineralization of the area is considered to be associated with this intrusive activity.

During Tertiary time, volcanic rocks composed of rhyolite, latitic andesite, associated tuffs and some subordinate beds of conglomerate or breccia sandstone shale, and limestone erupted along the Black Mountains and parts of the southern Cerbat Mountains. The volcanic flows rest on Precambrian crystalline rocks and have been invaded and displaced in part by masses of porphyry that are closely related in composition to some of the flows. They are also cut by numerous dikes and small irregular intrusive bodies of rhyolite and other rocks. The volcanic flows as a whole dip to the east.[6]

Large quantities of erosional debris were shed from rising mountain blocks during late Tertiary time. These sediments were deposited into the basins and valleys which parallel present day mountains. The sediments accumulated to several thousand feet and are named by Longwell[7] as the Muddy Creek formation. Recent erosion from the higher topography is still contributing sediment as alluvial deposits of sand and gravel similar to the Muddy Creek formation.

b. Study Area Characteristics

The Cerbat/Black Mountain Planning Units cover approximately 3500 square miles of land surface. Most of the area is within the basin and range province. This province is characterized by fault-block mountain ranges, generally aligned north-south, separated by wide, flat, debris-filled valleys. However, the Grand Wash Cliffs in the eastern portion of the area form a portion of the western boundary of the Colorado Plateau Province -- a province of essentially flat-lying rock layers that have been uplifted 7000-10,000 feet.

c. Topographic Features and Landforms

The main topographic features of the area can be seen in Figure II-6. They are from east to west:

- The Grand Wash Cliffs including the Music Mountains with elevations from slightly over 3000 feet to 6760 feet.

- The Hualapai Valley (with an elevation from slightly below 2800 feet to over 3000 feet) which in part contains interior drainage flowing into Red Lake.

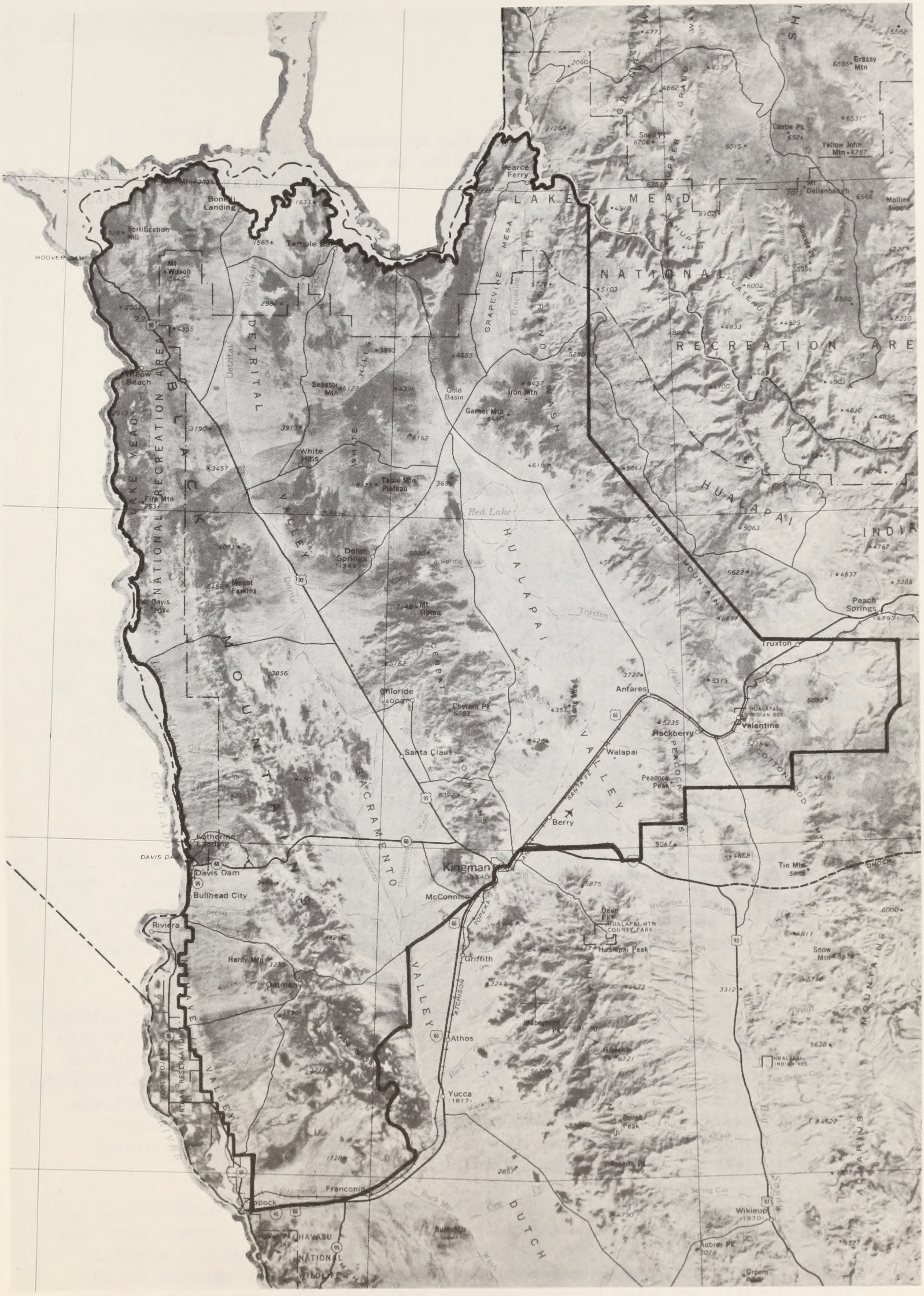

FIGURE II-6 TOPOGRAPHIC FEATURES – ES AREA

- The Cerbat Mountains ranging in elevation from over 3000 feet to the highest point in the area, Mt. Tipton at 7148 feet. The White Hills are a northern extension of this range.

- The Detrital-Sacramento Valley Basin with the Detrital Valley draining to the north into Lake Mead and the Sacramento Valley draining to the south. Elevations in these valleys range from below 2000 feet to over 3000 feet.

- The Black Mountains with elevations from almost 3000 feet to over 5000 feet. The two highest elevations of this range are Battleship Mountain in the southern portion and Mt. Perkins to the north.

- The Colorado River, the major through-flowing drainage of the area, flows southward with an average elevation of 500 feet.

The topographic features of the region have gradually been formed during the past 60 million years by the geologic processes of uplift, weathering, and erosion. Water, as in most places, is the major agent of erosion, with wind a minor factor. Most of the erosion takes place during periodic summer cloudbursts or with some runoff during winter storms. Intermittently flowing streams from the mountain ranges gradually filled the inner basins with debris. Eventually the material was carried into the Colorado River and removed from the area. One exception is the interior drainage into Red Lake in the Hualapai Valley. These natural processes operate slowly and change is usually imperceptible during man's lifetime.

d. Paleontology

Extensive library research has shown few occurrences of fossils. Precambrian crystalline and volcanic rocks are usually unfossiliferous. Marine fossils of Cambrian age are present in the Grand Wash Cliffs, but are commonplace and of little consequence. No fossils from the Quaternary sediments have been reported but could be found eventually in higher eroded areas.

Until the fire of 1976, Rampart Cave (Diamond Bar/Gold Basin allotment) contained significant deposits of well-preserved Pleistocene-age materials including plant macrofossils, pollen, and animal bones.[8-13] Although the fire destroyed significant parts of this, researchers hope that the remainder has not been irreparably damaged by the smoke and water, and that salvage work can preserve this source of valuable paleontological information. Muav Caves also contained some dung of the extinct Shasta ground sloth, but stratigraphy was lost in archaeological excavations.

Numerous additional packrat middens dating from 8500--30,000 years ago have been investigated from small caves and crevices near Rampart Cave and in Iceberg Canyon.[14,15] They document the presence of woodland species (juniper, pinyon, single-leaf ash) intermixed with desert species in an area presently occupied by the creosote bush-bur sage communities of the Desertscrub Formation.

## 3. Soils

### a. Soil Associations

The Cerbat/Black Mountain area is characterized by a series of broad smooth plains and valleys separated by hills and low mountains. The soils of the broad valleys and plains have formed in recent and old alluvium derived mainly from sedimentary and acid and basic igneous rocks. The soils of the hills and low mountains have formed in place from sedimentary and igneous rocks, which include limestone, sandstone, granite and granite gneiss, schist, andesite, latite, rhyolite, and basalt.

Twelve soil associations are recognized in the area. They are indicated by acreage in Table II-2 and by allotment in Table II-5. The selected soil features and interpretation of these soils are described in Table II-3. They are also described further in Appendix C and their distribution in the ES area is shown in Figure II-7.

### b. Erosion and Sediment Yield

Erosion in the ES area may be caused by both wind and water; however, wind erosion is severe only occasionally, when open bare or almost bare desert areas become dry and are subjected to strong winds. Field observations indicate that some wind erosion has occurred in the Red Lake-Hackberry area. Locally, small areas of low (6-18-inch accumulations) sand dunes have formed. These appear to be fairly well stabilized by the desert vegetation. The hazards of wind erosion in the area as a whole are not considered significant.

Erosion due to water action within the total ES area is relatively minor except for localized sheet and gully erosion throughout the area. The basic potential for water-caused erosion is generally low due to the following characteristics of the resource area:

- Moderately to strongly sloping uplands, dissected with coalescing alluvial fans and nearly level broad valley floors interrupted by several low to moderate elevation mountain ranges;
- Soils of a relatively coarse texture with a moderate to moderately rapid permeability rate;
- A relatively low annual rainfall, of which more than half falls as gentle winter rains.

TABLE II-2

SOIL ASSOCIATIONS AND ACRES WITHIN
CERBAT/BLACK MOUNTAIN ES AREA

| Soil Association | | Acres* | Percent of Total |
|---|---|---|---|
| 1. | Antho-Vint-Gilman | 89,696 | 3.7% |
| 2. | Laveen-Rillito-Carrizo-Antho | 182,385 | 7.5 |
| 3. | Lomitas-Rock Outcrop-Gachado | 51,800 | 2.1 |
| 4. | Anthony-Vinton-Agua | 753,793 | 31.1 |
| 5. | Latene-Rillino-Cave | 50,768 | 2.1 |
| 6. | Cave | 83,530 | 3.5 |
| 7. | Cellar-House Mountain-Rock Outcrop | 592,568 | 24.6 |
| 8. | Lithic Torriorthents-Rock Outcrop | 2,428 | 0.1 |
| 9. | Nickel-Rillino-Anthony | 225,262 | 9.3 |
| 10. | Tortugas-Purner-Jacks | 160,771 | 6.6 |
| 11. | Cabezon-Rudd-Thunderbird | 32,080 | 1.3 |
| 12. | Barkerville-Gaddes-Rock Outcrop | 195,785 | 8.1 |
| | Total Acres | 2,420,866 | 100.0% |

*Includes private, uncontrolled acres.

Sources: U.S. Soil Conservation Service, Natural Resource Conservation Districts, Mohave County, 1974; Arthur D. Little, Inc., acreage estimates.

TABLE II-3

SOIL FEATURES AND INTERPRETATION
CERBAT/BLACK MOUNTAIN RESOURCE AREA

| | Selected Soil Features | | | | | Selected Soil Interpretation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | | | | | | | | Use Potential For: | | |
| Association, Major Components, and Classification | Dominant Slope (Interpretive Slope) | Depth to Bedrock or Hardpan (inches) | Representative Profile Textures | Important Features Including Soil Reaction | Permeability | Hydrologic Group | Erosion Hazard (wind and water) | Surface Irrigated Cropland | Range | Revegitation |
| 1. Antho-Vint-Gilman Association | | | | | | | | | | |
| Antho (50%) Typic Torrifluvents, Coarse-loamy, Mixed (calcareous), Hyperthermic | 0-5% (0-2) | >60 | Sandy loam and gravelly sandy loam | Stratified, subject to flooding. pH-Neutral to moderately alkaline 7.0 to 8.4 | Moderately rapid | B | Slight | Medium | Very low | Very low |
| Vint (30%) Typic Torrifluvents Sandy, Mixed Hyperthermic | 0-5 (0-2) | >60 | Loamy sand over loamy fine sand | Stratified, subject to flooding. pH-Neutral to moderately alkaline 7.0 to 8.4 | Moderately rapid | B | Slight | Medium | Very low | Very low |
| Gilman (10%) Typic Torrifluvents Coarse-loamy, Mixed (calcareous), Hyperthermic | 0-2 (0-2) | >60 | Loam over very fine sandy loam or silt loam | Stratified, subject to flooding. pH-Neutral to strongly alkaline 7.0 to 9.0 | Moderate | B | High | High | Very low | Very low |
| 2. Laveen-Rillito-Carrizo-Antho Association | | | | | | | | | | |
| Laveen (20%) Typic Calciorthids, Coarse-loamy, Mixed, Hyperthermic | 0-5 (0-2) | >60 | Loam over limy loam | High lime. pH-Mildly to strongly alkaline 7.4 to 9.0 | Moderate | B | High | High | Very low | Very low |
| Rillito (20%) Typic Calciorthids, Coarse-loamy, Mixed, Hyperthermic | 0-8 (0-2) | >60 | Gravelly sandy loam over limy gravelly sandy loam | High lime, gravelly. pH-Mildly to strongly alkaline 7.4 to 9.0 | Moderately rapid | B | Slight | Medium | Very low | Very low |
| Carrizo (25%) Typic Torriorthents, Sandy-skeletal, Mixed, Hyperthermic | 0-8 | >60 | Loamy fine sand over very gravelly coarse sands | Very gravelly and sandy stratified, subject to flooding. pH-Neutral to strongly alkaline 7.4 to 9.0 | Very rapid | A | Slight | Very low | Very low | Very low |
| Antho (25%) Typic Torrifluvents, Coarse-loamy, Mixed (calcareous), Hyperthermic | 0-5 (0-2) | >60 | Sandy loam and gravelly sandy loam | Stratified, subject to flooding. pH-Neutral to moderately alkaline 7.0 to 8.4 | Moderately rapid | B | Slight | Medium | Very low | Very low |
| 3. Lomitas-Rock Outcrop-Gachado Association | | | | | | | | | | |
| Lomitas (35%) Lithic Camborthids, Loamy-skeletal, Mixed Hyperthermic | 15-40 | 12-18 | Very cobbly loam over very gravelly or cobbly loam over bedrock | Cobbly with lime layer and bedrock. pH-Mildly to moderately alkaline 7.4 to 8.4 | Moderate | D | Slight | Very low | Very low | Very low |
| Rock Outcrop and Stony Land (40%) | – | 0-4 | – | Depth to rock | – | D | – | – | – | – |
| Gachado (15%) Lithic Haplargids, Loamy-skeletal, Mixed, Hyperthermic | 8-25 | 10-20 | Very cobbly loam over very gravelly sandy clay loam over bedrock | Depth to rock. pH-Mildly to moderately alkaline 7.4 to 8.4 | Slow | D | Slight | Very low | Very low | Very low |

TABLE II-3 (Continued)

| (1) Association, Major Components, and Classification | (2) Dominant Slope (Interpretive Slope) | (3) Depth to Bedrock or Hardpan (inches) | (4) Representative Profile Textures | (5) Important Features Including Soil Reaction | (6) Permeability | (7) Hydrologic Group | (8) Erosion Hazard (wind and water) | (9) Surface Irrigated Cropland | (10) Range | (11) Revegitation |
|---|---|---|---|---|---|---|---|---|---|---|
| | Selected Soil Features | | | | | Selected Soil Interpretation | | Use Potential For: | | |
| **4.** Anthony-Vinton-Agua Association | | | | | | | | | | |
| Anthony (50%) Typic Torrifluvents, Coarse-loamy, Mixed (calcareous), Thermic | 0-5 % (0-2) | >60 | Sandy loam and gravelly sandy loam | Stratified, subject to flooding. pH-Neutral to moderately alkaline, 7.0 to 8.4 | Moderately rapid | B | Slight | Medium | Very low to low | Very low to low |
| Vinton (20%) Typic Torrifluvents, Sandy, Mixed, Thermic | 0-5 (0-2) | >60 | Loamy sand over stratified loamy sands | Stratified, subject to flooding. pH-Neutral to moderately alkaline, 7.0 to 8.4 | Moderately rapid | B | Slight | Medium | Very low | Very low |
| Agua (15%) Typic Torrifluvents, Coarse-loamy over Sandy or Sandy skeletal, Mixed (calcareous), Thermic | 0-2 | >60 | Loam over sand and very gravelly sand | Stratified, subject to flooding. pH-Neutral to strongly alkaline, 7.0 to 9.0 | Moderate | B | High | Medium | Very low | Very low |
| 5. Latene-Rillino-Cave Association | | | | | | | | | | |
| Latene (30%) Typic Calciorthids, Coarse-loamy, Mixed, Thermic | 0-5 (0-2) | >60 | Loam over loam or sandy loam | High lime. pH-Mildly to strongly alkaline, 7.4 to 9.0 | Moderate | B | High | High | Very low to low | Very low to low |
| Rillino (30%) Typic Calciorthids, Coarse-loamy, Mixed, Thermic | 2-15 (2-8) | >60 | Gravelly fine sandy loam over limy, gravelly loam or fine sandy loam | High lime, gravelly. pH-Mildly to strongly alkaline, 7.4 to 9.0 | Moderately rapid | B | Slight | Very low | Very low to low | Very low to low |
| Cave (15%) Typic Paleorthids, Loamy, Mixed, Thermic, Shallow | 2-15 | 4-20 | Gravelly sandy loam over limy and gravelly loam over hardpan | Depth to pan, high lime. pH-Mildly to moderately alkaline, 7.4 to 8.4 | Moderate | D | Moderate | Very low | Very low | Very low |
| 6. Cave Association | | | | | | | | | | |
| Cave (70%) Typic Paleorthids, Loamy, Mixed, Thermic, Shallow | 1-30 | 4-20 | Gravelly sandy loam over limy and gravelly loam over hardpan | Depth to pan, high lime. pH-Mildly to moderately alkaline, 7.4 to 8.4 | Moderate | D | Moderate | Very low | Very low | Very low |
| Nickel (15%) Typic Calciorthids, Loamy-skeletal, Mixed Thermic | 15-30 | >60 | Very gravelly sandy loam | High lime, gravelly. pH-Moderately to strongly alkaline, 7.9 to 9.0 | Moderate | B | Slight | Very low | Very low | Very low |

TABLE II-3 (Continued)

| (1) Association, Major Components, and Classification | (2) Dominant Slope (Interpretive Slope) | (3) Depth to Bedrock or Hardpan (inches) | (4) Representative Profile Textures | (5) Important Features Including Soil Reaction | (6) Permeability | (7) Hydrologic Group | (8) Erosion Hazard (wind and water) | (9) Use Potential For: Surface Irrigated Cropland | (10) Use Potential For: Range | (11) Use Potential For: Revegitation |
|---|---|---|---|---|---|---|---|---|---|---|
| | Selected Soil Features | | | | | Selected Soil Interpretation | | | | |
| 7. Cellar-House Mountain-Rock Outcrop Association | | | | | | | | | | |
| Cellar (35%) Lithic Torriorthents, Loamy-skeletal, Mixed, Nonacid, Thermic | 15-45% | 4-20 | Very gravelly sandy loam over bedrock | Depth to rock, slope. pH-Neutral to moderately alkaline, 6.6 to 8.4 | Moderate | D | Slight | Very low | Very low | Very low |
| House Mountain (25%) Little Torriorthents, Loamy, Mixed, Nonacid, Thermic | 15-60 | 5-20 | Cobbly loam over cobbly light clay loam over bedrock | Depth to rock, slope. pH-Mildly to moderately alkaline, 7.4 to 8.4 | Moderate | D | Moderate | Very low | Very low | Very low |
| Rock Outcrop and Stony Land (30%) | 30-75 | 0-4 | – | Depth to rock, slope. | – | D | – | – | – | – |
| 8. Lithic Torriorthents-Rock Outcrop Association | | | | | | | | | | |
| Torriorthents (75%) (Thermic) | 5-75 (15-75) | Variable | Variable | Depth to rock, slope. pH-Mildly to moderately alkaline, 7.4 to 8.4 | Variable | D | Moderate | Very low | Very low | Very low |
| Rocky Outcrop and Stony Land (20%) | – | 0-4 | -- | Depth to rock, slope. | – | D | – | – | – | – |
| 9. Nickel-Rillino-Anthony Association | | | | | | | | | | |
| Nickel (60%) Typic Calciorthids, Loamy-skeletal, Mixed Thermic | 2-30 (2-8) | 60 | Very gravelly sandy loam | High lime, gravelly. | Moderate | B | Slight | Very low | Very low | Very low |
| Rillino (20%) Typic Calciorthids, Coarse-loamy, Mixed, Thermic | 2-15 | 60 | Gravelly fine sandy loam over limy, gravelly loam or fine sandy loam | High lime, gravelly. pH-Mildly to strongly alkaline, 7.4 to 9.0 | Moderately rapid | B | Slight | Very low | Very low | Very low |
| Anthony (10%) Typic Torrifluvents, Coarse-loamy, Mixed (calcareous), Thermic | 0-5 | 60 | Sandy loam and gravelly sandy loam | Stratified, subject to flooding. pH-Neutral to moderately alkaline, 7.0 to 8.4 | Moderately rapid | B | Slight | Medium | Very low | Very low |

TABLE II-3 (Continued)

| | Selected Soil Features | | | | | Selected Soil Interpretation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | | | | | | | | Use Potential For: | | |
| **Association, Major Components, and Classification** | **Dominant Slope (Interpretive Slope)** | **Depth to Bedrock or Hardpan (inches)** | **Representative Profile Textures** | **Important Features Including Soil Reaction** | **Permeability** | **Hydrologic Group** | **Erosion Hazard (wind and water)** | **Surface Irrigated Cropland** | **Range** | **Revegitation** |
| **10.** Tortugas-Purner-Jacks Association | | | | | | | | | | |
| Tortugas (40%) Lithic Haplustolls, Loamy, Skeletal, Carbonatic, Mesic | 5-45% (15-45) | 6-20 | Very cobbly loam over bedrock | Depth to rock, slope. pH-Moderately alkaline, 7.9 to 8.4 | Moderate | D | Slight | Very low | Medium | Medium |
| Purner (25%) Lithic Haplustolls, Loamy, Mixed, Mesic | 2-10 | 7-18 | Gravelly loam over bedrock | Depth to rock. pH-Moderately alkaline, 7.9 to 8.4 | Moderate | D | Moderate | Very low | Medium | Medium |
| Jacks (15%) Udic Haplustolls, Fine, Mixed, Mesic | 5-30 (8-15) | 24-42 | Fine sandy loam or gravelly loam over heavy clay loam or clay over bedrock | Depth to rock, clayey, slope. pH-Neutral to moderately alkaline, 6.6 to 8.4 | Slow | C | Slight | Very low | Medium | Medium |
| 11. Cabezon-Rudd-Thunderbird Association | | | | | | | | | | |
| Cabezon (25%) Lithic Arquistolls, Clayey, Montmorillonitic, Mesic | 8-30 (15-30) | 8-20 | Cobbly loam over cobbly clay over bedrock | Cobbly-stoney, depth to rock, slope. pH-Neutral to moderately alkaline, 6.6 to 8.4 | Slow | D | Moderate | Very low | Medium | Medium |
| Rudd (25%) Lithic Calciustolls, Loamy-skeletal, Mesic | 0-30 (2-8) | 6-20 | Cobbly and gravelly loam over bedrock | Depth to rock, cobbly-stony. pH-Mildly to moderately alkaline, 7.4 to 8.4 | Moderate | C | Very low | Very low | Medium | Medium |
| Thunderbird (20%) Typic Arguiustolls, Fine, Montmorillonitic, Mesic | 2-15 | 20-40 | Cobbly clay loam over clay over bedrock | Depth to rock, shrink-swell, clayey. pH-Neutral to moderately alkaline, 6.6 to 8.4 | Slow | D | Moderate | Very low | Medium | Medium |
| 12. Barkerville-Gaddes-Rock Outcrop Association | | | | | | | | | | |
| Barkerville (30%) Typic Ustorthents, Sandy Skeletal, Mixed, Mesic | 15-60 | 20-40 | Gravelly sandy loam or gravelly loamy sand over weathered granite over bedrock | Gravelly, depth to rock, slope. pH-Slightly acid to mildly alkaline 6.1 to 7.8 | Moderately rapid | C | Slight | Very low | Medium | Medium |
| Gaddes (20%) Ustollic Haplorgids, Fine-loamy, Mixed, Mesic | 5-30 | 20-40 | Gravelly sandy loam surfaces over gravelly clay loam over bedrock | Depth to rock, gravelly. pH-Slightly acid to mildly alkaline, 6.1 to 7.8 | Slow | C | Moderate | Very low | Medium | Medium |
| Rock Outcrop and Stony Land (30%) | – | 0-40 | – | – | – | D | – | – | – | – |

**TABLE II-3 (Continued)**

1. Percent association is of ES area and percent components are of association total.

2. Interpretive slope is the range of soil slope on which interpretations are based.

3. Depths are those for each named soil as defined for the series. Depths outside these limits may be present in included soils.

4. General profile textures based on defined characteristics of soil.

5. Features listed are those that have a major influence on soil use and management. Soil Reaction — The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that has a pH of 7.0 is neutral in reaction because it is neither acid or alkaline. In words, the degrees of acidity or alkalinity are expressed as follows:

| | pH | | pH |
|---|---|---|---|
| Extremely acid | Below 4.5 | Neutral | 6.6 to 7.3 |
| Very strongly acid | 4.5 to 5.0 | Mildly alkaline | 7.4 to 7.8 |
| Strongly acid | 5.1 to 5.5 | Moderately alkaline | 7.9 to 8.4 |
| Medium acid | 5.6 to 6.0 | Strongly alkaline | 8.5 to 9.0 |
| Slightly acid | 6.1 to 6.5 | Very strongly alkaline | 9.1 and higher |

6. Permeability is the quality of a soil that enables water or air to move through it. Permeability class is determined by the permeability of the slowest layer in the soil profile.

**Rate in Inches/Hour**

| | | | |
|---|---|---|---|
| Very slow | $<$.06 | Moderately rapid | 2-6 |
| Slow | .06-.2 | Rapid | 6-20 |
| Moderately slow | .2-.6 | Very rapid | $>$20 |
| Moderate | .6-2.0 | | |

7. Hydrologic Soil Groups: A — Low runoff potential; B — Moderately low runoff potential; C — Moderately high runoff potential; D — High runoff potential.

8. Erosion hazard is the inherent susceptibility of the soil to erosion by water and wind.

9. The assigned ratings show the potential for surface irrigation for field crop production. Slope and other soil properties such as available water capacity, permeability, and salt content are reflected in this rating. Potential for other irrigation methods will need to be evaluated.

10. Four-part rating (high, medium, low, and very low) reflecting response to kinds of management applied.

11. Four-part rating (high, medium, low, and very low) reflecting response to precipitation and position.

**Source:** U.S. Soil Conservation Service, National Resource Conservation Districts, Mohave County, 1975.

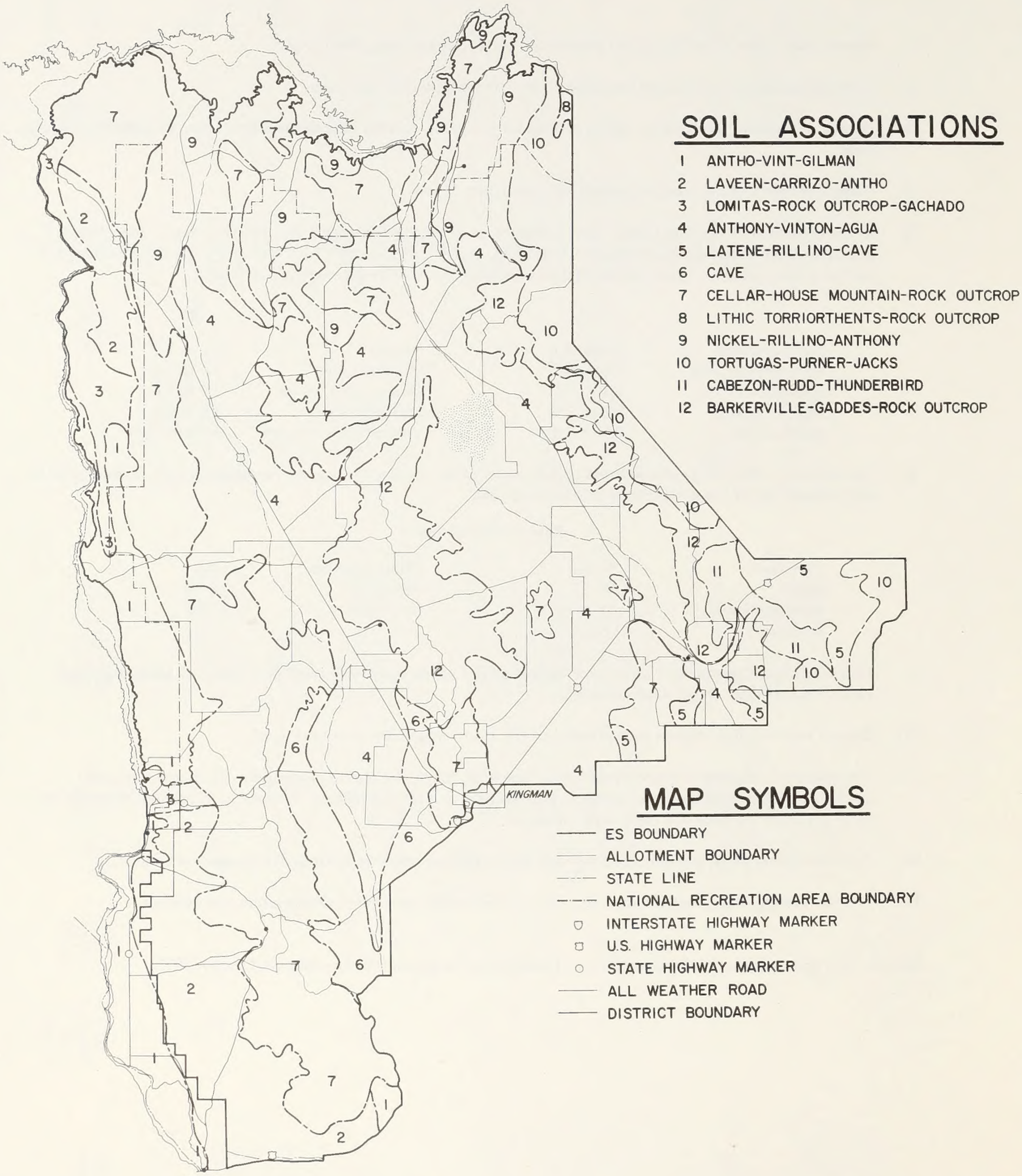


FIGURE II-7 DISTRIBUTION OF SOIL ASSOCIATIONS

An erosion hazard map for the area is shown in Figure II-8. This map is based on the Soil Erodibility Factor (K) of the named soils in Arizona. "K" is a measure of the inherent susceptibility of soil particles to detachment and transport by rainfall and runoff. The parameters used in arriving at K values are texture, organic matter, structure, permeability, clay mineralogy, and coarse fragments in the layer being evaluated. The 12* K value classes used are as follows:

| K Value | Classification |
|---|---|
| .10, .15, .17 | Classified as slight erosion hazards |
| .20, .24, .28, .32 | Classified as moderate erosion hazards |
| .37, .43, .49 | Classified as high erosion hazards |
| .55, .64 | Classified as very high erosion hazards |

The K values for the named soils in the associations ranged from .49 on the soils with a high percentage of silt and very fine sand to .10 for sandy and gravelly or very gravelly and very cobbly soils.

Two erosion hazard classes recognized in the area are:

(1) Slight erosion hazards - soil association with K values of .17 or less.

(2) Moderate erosion harards - soil association with K values between .17 and .32.

Six of the soil associations in the area, as shown in Figure II-7, have slight erosion hazards and five average out as having moderate. However, all of the moderate units were within the lower limits of the moderate class.

The sediment yields for each allotment are low to very low, as shown in Table II-4. This information is portrayed graphically in Figure II-9 for the ES area. The erosion and sediment yield characteristics for the ephemeral and custodial allotments, except for those ephemeral acres included in the AMPs, have not been surveyed by the BLM and therefore are not determined.

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*U.S. Department of Agriculture, Soil Conservation Service, Technical Notes, Phoenix, Arizona, September 1976.

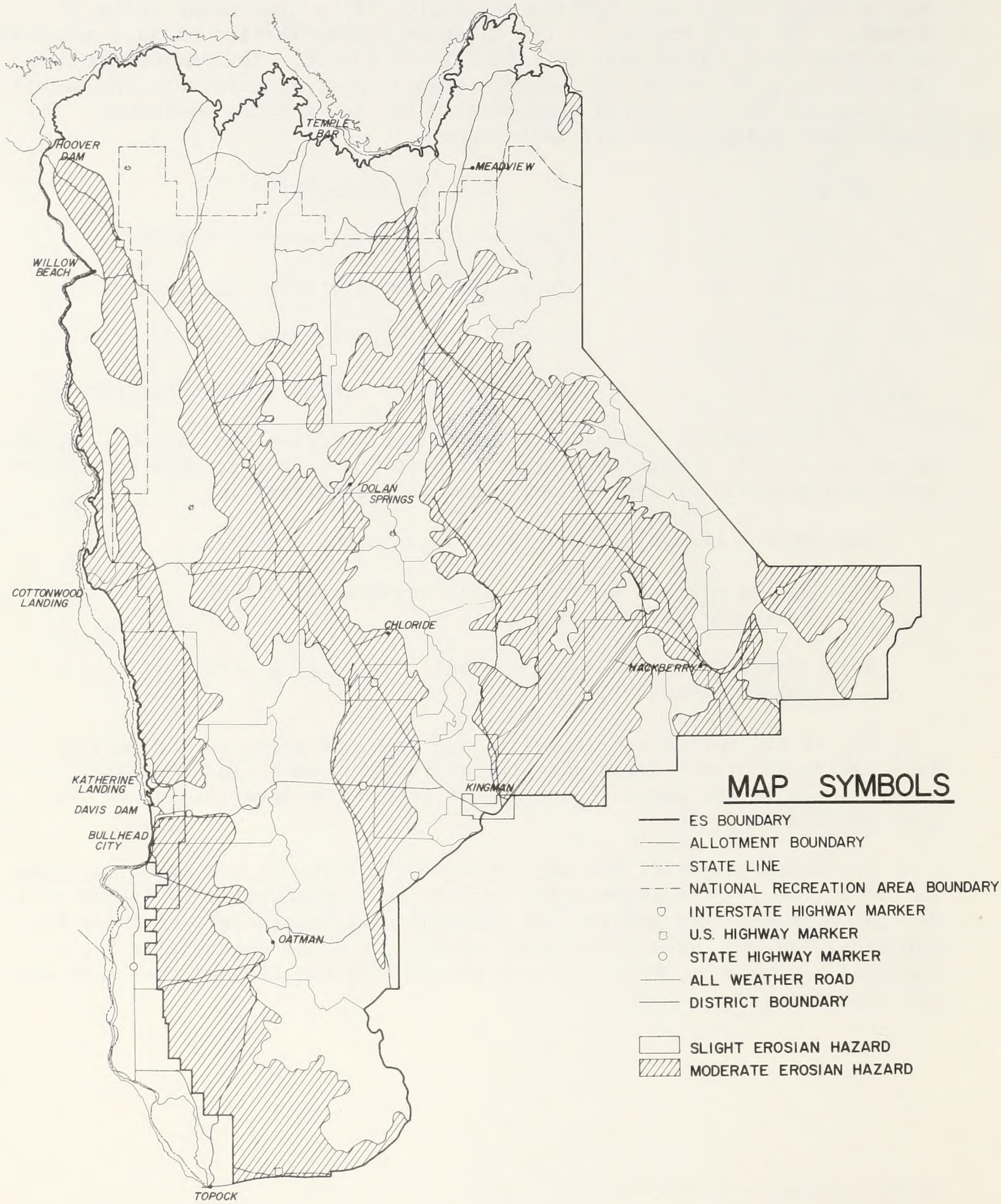


**FIGURE II-8 SOIL EROSION POTENTIAL**

TABLE II-4

SEDIMENT YIELD BY ALLOTMENTS

| Allotment Number and Name | Acre-feet/ Square Mile/ Year* | Class | Acre-feet/ Year |
|---|---|---|---|
| 7A - Big Ranch | 0.1726 | Very low | 165.24 |
| 10A - Black Mountain | 0.2242 | Low | 43.28 |
| 15A - Cane Springs | 0.2812 | Low | 40.76 |
| 17A - Canyon Ranch | 0.2688 | Low | 56.96 |
| 18A - Castle Rock | 0.3268 | Low | 5.36 |
| 19A - Cedar Canyon | 0.2736 | Low | 39.99 |
| 20A - Cerbat/Quail Springs/Turkey Track | 0.2520 | Low | 28.50 |
| 23A - Clay Springs | 0.2475 | Low | 4.80 |
| 26A - Crozier Canyon Ranch | 0.2051 | Low | 34.30 |
| 27A - Curtain | 0.2657 | Low | 4.52 |
| 29A - Gold Basin/Diamond Bar | 0.2668 | Low | 69.98 |
| 30A - Dolan Springs | 0.2469 | Low | 28.18 |
| 34A - Ft. McEwen | 0.2249 | Low | 36.46 |
| 36A - Gediondia | 0.2234 | Low | 7.04 |
| 42A - Hackberry | 0.2103 | Low | 23.00 |
| 55A - Mineral Park | 0.3346 | Low | 8.48 |
| 56A - Mud Springs | 0.2702 | Low | 24.01 |
| 57A - Music Mountain | 0.2248 | Low | 5.58 |
| 58A - Mt. Tipton | 0.3149 | Low | 6.16 |
| 60A - Pine Springs | 0.3282 | Low | 3.84 |
| 61A - Portland Spring | 0.1538 | Very low | 9.99 |
| 65A - Silver Creek | 0.2227 | Low | 25.41 |
| 66A - Stockton Hill | 0.4348 | Low | 1.87 |
| 68A - Thumb Butte | 0.2693 | Low | 10.96 |
| 70A - Truxton Canyon | 0.3239 | Low | 9.97 |
| 71A - Upper Music | 0.2906 | Low | 21.49 |
| Total | | | 686.13 |

*Acre-feet per square mile per year; includes partial ephemeral range areas.

Source: Table I-3; BLM Sediment Yield Data.

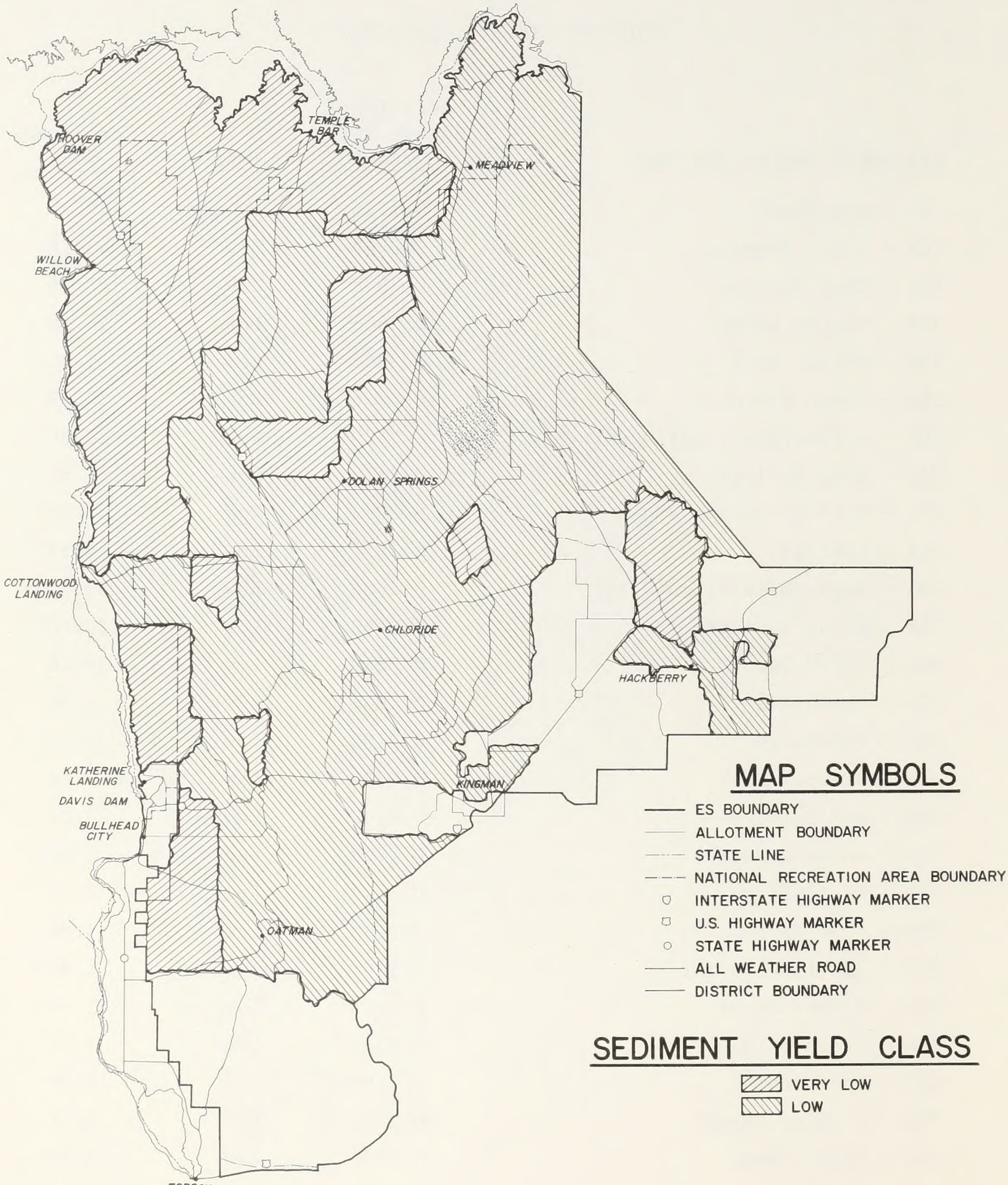


**FIGURE II-9 SEDIMENT YIELD MAP**

## 4. Water Resources*

### a. Groundwater Sources

(1) Geohydrologic Setting. The ES study area contains two major north-trending mountain chains: the White Hill-Cerbat Mountain-Hualapai Mountain chain and the Wilson Ridge-Black Mountain chain. Lying adjacent to the ranges are broad inter-mountain valleys that are elongated in the north-south directions.

These mountainous areas are comprised of Precambrian metamorphic and igneous rocks, and Tertiary volcanics that yield only small quantities of water to wells and springs. In contrast, the valleys are filled with thick deposits of Tertiary and younger clastic and volcanic rocks that yield moderate to large supplies of water to wells. Because the rocks in the mountains have small permeabilities and are elevated above the surrounding high-yield Tertiary rocks, there is little known groundwater circulation between the major north-trending valley systems.

There are three groundwater basins which can be conveniently defined in the region based on the water level data shown in Figure II-10: the Hualapai, Sacramento, and Detrital basins. The margins of these groundwater basins coincide approximately with major topographic divides in the region. Groundwater in the area west of Wilson Ridge and the Black Mountains drains directly westward toward the Colorado River. Both surface-water and groundwater drainage on Hualapai Plateau is toward the northeast toward the Colorado River and Lake Mead.[1] There are no comprehensive published groundwater data or reports for the Detrital Basin or area west of the Black Mountains owing to the lack of developments in these areas. Nor is there a complete inventory of wells or springs for the region.

(2) Groundwater Use. Groundwater use in the area is concentrated in the Sacramento and Hualapai basins. The U.S. Geological Survey has maintained estimates of total groundwater pumpage in these basins since 1950. Prior to 1964, total pumpage from the Hualapai and Sacramento basins was estimated to be less than 1000 and 500 acre-feet, respectively, per year. After 1964, production has increased to present (1975) rates of approximately 4000 and 8000 Aft/yr, respectively. The bulk of the pumpage in the Hualapai Valley is distributed between crop irrigation and municipal service for Hackberry and Kingman. The Duval Corporation well field accounts for the major production from the Sacramento Basin. Current stock watering use in these basins is virtually negligible.

No major groundwater developments exist in the Detrital Basin or the area west of the Black Mountains. Current use in these areas is restricted to small supplies for domestic, mine, and stock needs. Appendix D lists the reported wells in the region and Figure II-10 shows their distribution.

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*References for this subsection follow on page II-236.

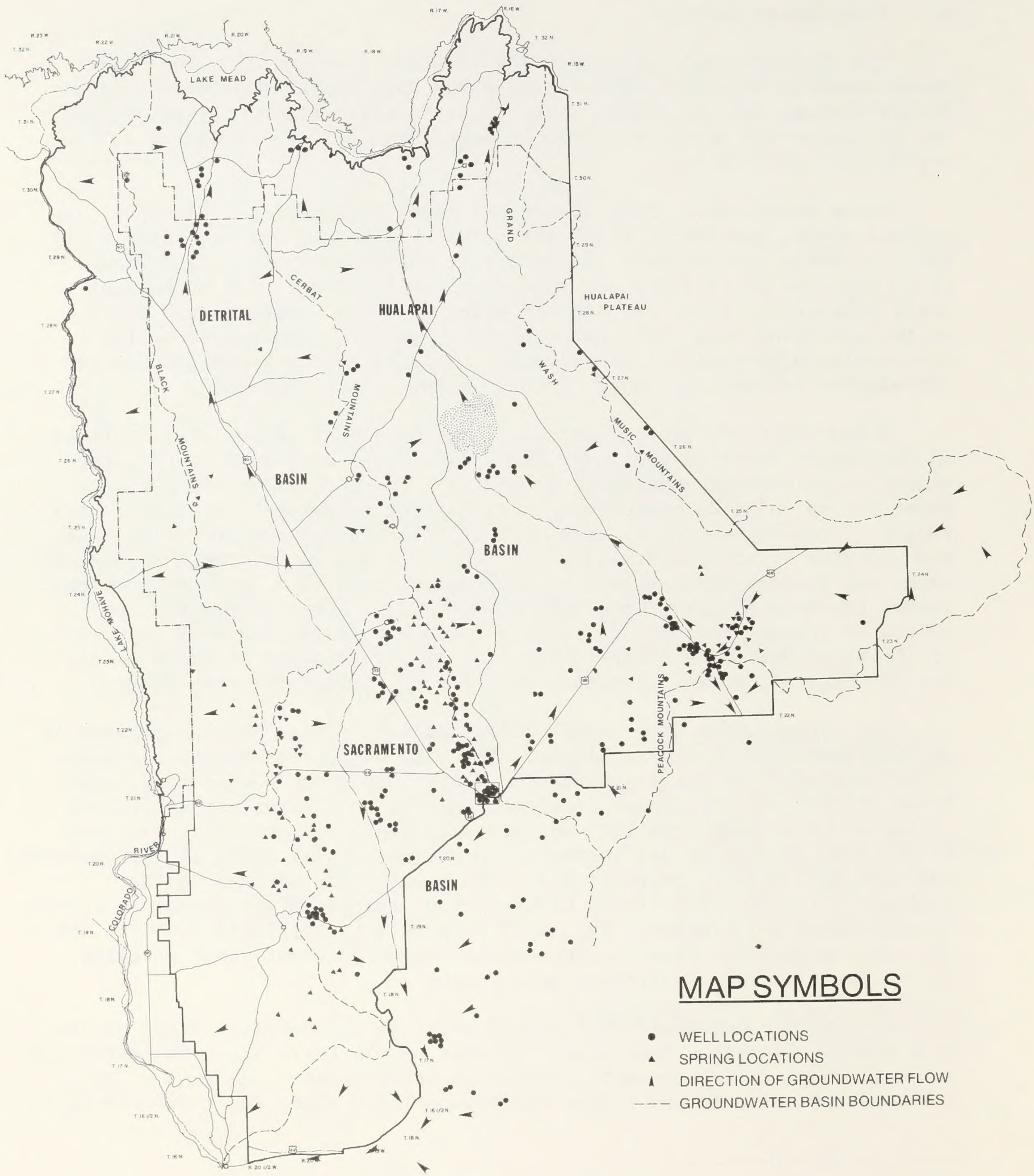


FIGURE II-10 LOCATION OF WELLS AND SPRINGS

Springs occur only in the elevated and mountainous areas in the region. Gillespie and Bentley[2] estimated that about half of the spring-water discharging into the Sacramento and Hualapai valleys is utilized for stock watering supplies. Springs recorded in agency records are listed in Appendix D and shown in Figure II-10.

(3) Principal Aquifers and Their Water-bearing Properties. The principal aquifers in the region are extensive water table and semi-confined systems that occur in the older Tertiary alluvium as defined by Gillespie and Bentley.[3] Based on seismic profiles conducted under the direction of R.H. Godson of the Branch of Astrogeology, USGS, Gillespie and Bentley[4] concluded that the alluvium and interbedded volcanic rocks in the Hualapai and Sacramento valleys are more than 4000 feet thick. The older alluvium is comprised of partially indurated clay to boulder-size fragments of granite, schist, gneiss, and volcanic rocks in a matrix of silty clay or sand. Weakly consolidated tuff and agglomerate are interbedded with the alluvium. Grain size decreases toward the center of the valleys. Figure II-11 summarizes the regional distribution of expected well yield.

Maximum well yields reported by Gillespie and Bentley[5] for the alluvial aquifers were 1500 gallons per minute in the Hualapai Valley. Transmissivities of the older alluvium ranged from 15,000-52,000 gallons per day per foot and specific capacities ranged from 3.9-12.9 gallons per minute per foot of drawdown for seven test wells in the Hualapai and Sacramento valleys.[6] No springs are known to discharge from the alluvium in the valley floors.

Depths to water in the older alluvium in the Hualapai Valley reported by Gillespie and Bentley[7] are 70-150 feet near Hackberry, 260 feet near the center of the valley, and 900 feet at the south end of the valley. In Sacramento Valley, depths to water are 300 feet near Yucca, and more than 1000 feet at the north end of the valley.

The primary water-bearing rocks in the mountain ranges and other elevated areas include weathered and fractured Precambrian metamorphic and igneous rocks, Tertiary volcanic and interbedded alluvial rocks, and local deposits of Tertiary and younger alluvium which flood canyons and valleys that drain from the mountains. Well yields from these rocks reported by Gillespie and Bentley[8] are 1-5 gallons per minute from fractured or weathered igneous and metamorphic rocks and 10-30 gallons per minute from wells drilled into thin deposits of alluvium. Depths to water are highly variable in the mountainous terrains.

One-hundred thirty springs and seeps that discharged principally from the igneous, metamorphic, and volcanic rocks in the mountain ranges were inventoried by Gillespie and Bentley.[9] The median discharge from these springs was only two gallons per minute, attesting to the generally poor transmissive character of these rocks and limited amounts of available water.

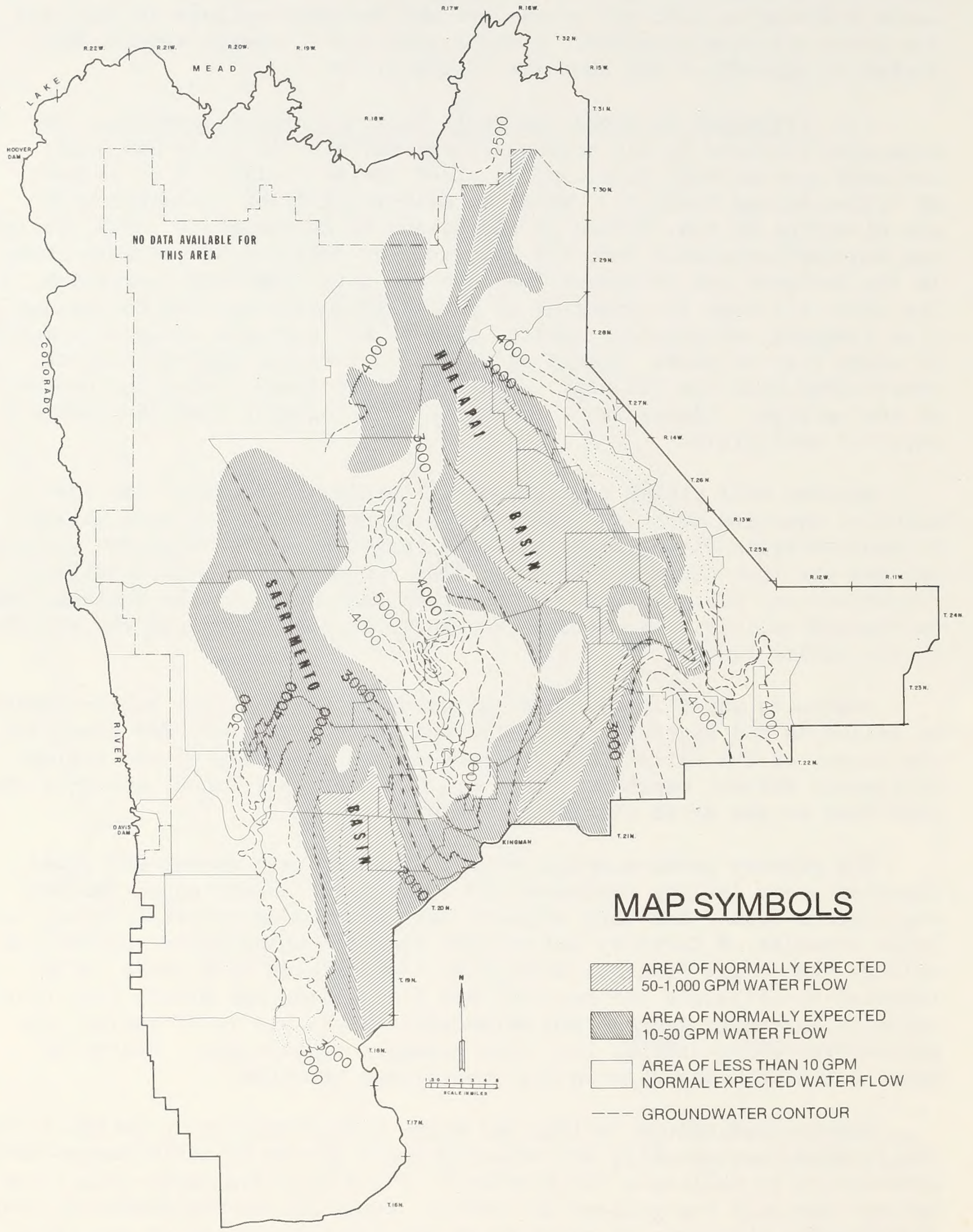


**FIGURE II-11 GENERALIZED GROUNDWATER BASIN**

Groundwater flow data for the region are sparse and are derived from two sources -- measurements from wells and elevations of springs. The known data for the region from various agency records are shown in Figure II-11. Supplemental data for the Hualapai and Sacramento valleys appear in Gillespie and others[10] and Gillespie and Bentley.[11] These data demonstrate that groundwater flow in the Hualapai and Detrital basins is generally northward to Lake Mead, whereas the flow in the Sacramento Basin is southward to Yucca and then westward to the Colorado River. Flow directions appear in Figure II-10. It is important to point out that although the Hualapai Valley is a closed surface-water drainage system that ends at the Red Lake Playa, groundwater flows northward under the playa toward Lake Mead. Similarly, water in the Hualapai Valley south of Hackberry flows southward toward the Big Sandy Basin.

Water level change data have been collected from selected wells in the region and appear in the USGS survey (issued annually). The maximum recorded water level changes occurred in the Kingman well field between 1960 and 1965 when extensive pumpage resulted in water level declines of 5-7 feet per year. Since 1965, production has been reduced 50% in the Kingman field, and as of 1971, declines stabilized at a rate of 1-2.5 feet per year.[12] Pumpage from the Duval Corporation wells in the Sacramento Valley has resulted in local water level declines that totaled 12-14 feet between October 1964 and February 1967. Water level declines are negligible to zero elsewhere in the region due to the small use of water for domestic, mine, and stock watering purposes. No permanent water level declines are known that have resulted from pumpage from existing stock watering wells.

(4) Groundwater Recharge. The groundwater recharge mechanisms that operate in the region consist primarily of infiltration of water into the coarse alluvium along the flanks of the mountains and losses of flood flows to the alluvium along ephemeral streams that discharge from the mountains. Lesser amounts of water infiltrate directly into the alluvium in the valleys from rainfall events, or as a result of ponding of water in playa lakes such as Red Lake.

Quantitative data on infiltration rates in the valley areas or along the outcrops of alluvium on the flanks of the mountains have not been developed for the region. However, excellent quantitative information exists to substantiate that major losses occur as a result of infiltration of flood runoff. Gillespie and Bentley[13] document the loss of water from Truxton Wash during the floods of December 10, 1965, and August 8, 1966. On the latter date, the discharge in Truxton Wash at Valentine was 1960 cubic feet per second (cfs). Approximately 4.5 miles downstream it had diminished to 753 cfs, and about 10 miles below Valentine the flow was only 402 cfs. No water from the flood reached Red Lake, which is about 25 miles below Valentine. Evidence that the same mechanism operates in small tributary streams is the fact that many such streams lose their identity as they are traced into the major valleys of the region. Gillespie and Bentley state that "although substantial streamflow occurs in the mountains as a result of high-intensity storms, the flow seldom reaches the middle of Hualapai Valley and only occasionally reaches Red Lake, where most of the inflow to the lake is lost to evaporation."

Based on estimates of groundwater discharge through the aquifer, Gillespie and Bentley[14] estimate that the average annual recharge to the part of the Hualapai Basin south of Red Lake is 5000 Aft/yr, and recharge to the Sacramento Basin north of Yucca is 4000 Aft/yr. Using these rough estimates, recharge in the region is calculated to be approximately 5 Aft per year per square mile. The actual recharge rates are obviously very large in the alluvial channels and alluvial fans adjacent to the mountains and very small in the mountains and undissected parts of the major valleys.

b. Evapotranspiration

Within the components of the hydrologic cycle, the single element that continuously influences field water balance is the one that is most difficult to measure -- evapotranspiration.[15] Evapotranspiration, broadly, is that amount of water required to produce the mature crop. It is the sum of volumes of water used by both the evaporation and the transpiration process. Most water used by a plant (transpiration) is converted to vapor and discharged into the atmosphere, thus reentering the hydrologic cycle.[16] Some water is maintaned by the plant in the tissue. Evaporation from the soil surface is dependent upon moisture availability and is less than evaporation from a free water surface. Figure II-12 shows annual evaporation from a free water surface (pan) and gives an indication of the relative energy available for evaporation from soil surfaces in the ES area. The rate of evapotranspiration is affected by external climatic factors of air temperature, humidity, wind velocity, and radiation (solar).

Evapotranspiration within specific vegetative types of the ES area is the principal mechanism through which water is consumed. For example, riparian and phreatophyte species of Acacia, Tamarisk, and Chilopsis (subsection 5 below) occur along streams and washes and along the Colorado River where water is most readily available for consumption. These species may use exorbitant amounts of water in the form of soil moisture and evapotranspiration rates are extremely high. However, the dominant plant species in the ES area are environmentally adapted to this low rainfall, high evaporative demand region. Species of Larrea, Ambrosia, Opuntia, and also the Acacia and Chilopsis species have the genetic ability to conserve moisture and reduce transpiration for substantial periods of time. Thus, actual water losses due to evapotranspiration are considerably lower throughout the ES area than potential evapotranspiration rates. The average annual potential evapotranspiration rate (Figure II-12) is approximately three times the normal annual precipitation for the area (Figure II-4), ranging from 25-40 inches for the frost-free period.[17]

Water drainages originating in zones of the above Desertscrub species are characterized by poor stream organization. Possibilities for controlling these are limited. Most soil moisture is lost through evapotranspiration nearly every year, regardless of plant cover, type, and density.[18] The only control measure assuring success for increasing surface-water yield and reducing evapotranspiration losses in these zones is control of surface runoff. Any reduction of surface vegetation is likely to reduce water yields.

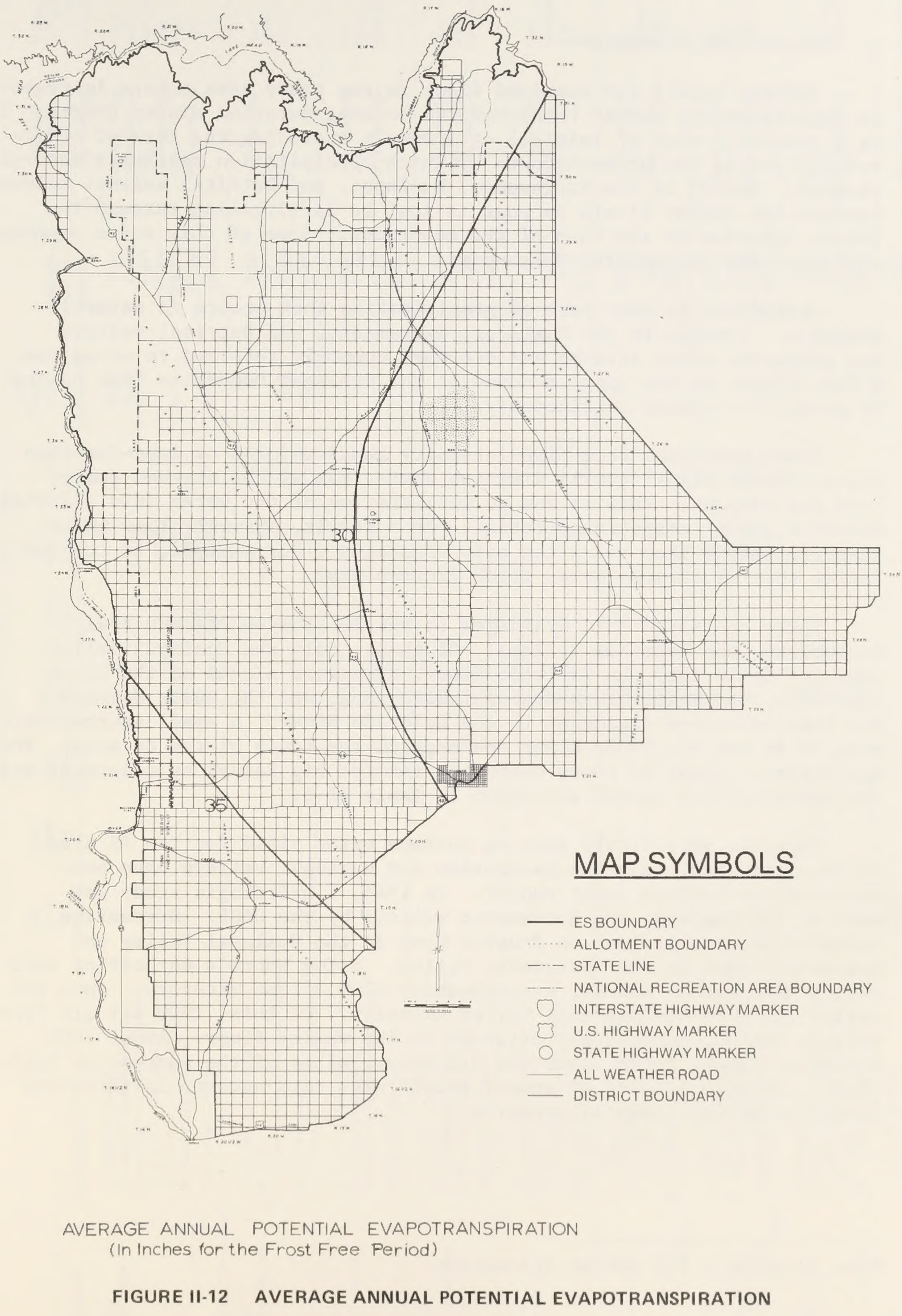


**FIGURE II-12 AVERAGE ANNUAL POTENTIAL EVAPOTRANSPIRATION**

c. Runoff and Streamflow

Surface runoff (or overland flow) in the study area occurs in response to high-intensity summer thunderstorms or long-duration winter storms. It is a result of rate of rainfall or snowmelt exceeding the rate of infiltration and is the primary route by which precipitation reaches a natural channel. Runoff in the Sacramento, Hualapai, and Detrital valleys seldom reaches the valley floors as most is lost to infiltration through the coarse alluvium at the base of the mountains. Some of this water eventually recharges the groundwater reservoir.

Streamflow is that part of precipitation that occurs in natural channels. Streams in the Hualapai, Sacramento, and Detrital valleys are ephemeral class streams and are more commonly referred to as washes. A few streams in the upper reaches of the Hualapai Mountains (out of the ES area) flow almost continuously.

Flows resulting from high-intensity thunderstorms or long-duration winter storms significantly diminish downstream as the streams emerge from the canyons. This is due to infiltration of the water into alluvial deposits and to evapotranspiration. As a result, channels lose their identity before they reach the main drainages. For example, in the Hualapai Valley several streams never reach Truxton Wash.

There are three main drainages in the ES area -- the Hualapai, Sacramento, and Detrital valleys. Of these, only the Hualapai Valley does not drain into the Colorado River. The west slopes of the Black Mountains, the White Hills-Hualapai Wash area, and the Music Mountains are less extensive drainages to the Colorado River. A small southeastern area is in the Big Sandy River drainage to the south of the ES area. The approximate extent of these drainages (except Big Sandy) by allotment and the potential for runoff are shown in Table II-5.

There is very little data on surface water yield for the ES area. Of the drainages, only the Sacramento and Hualapai valleys have been surveyed for surface water runoff. In 1964, a hydrologic study was made of the Hualapai and Sacramento valleys by the USGS. Streamflow research was carried out on Truxton Wash in the Hualapai Valley and Sacramento Wash in the Sacramento Valley. Using Moore's method* of estimating mean annual runoff, approximately 4000 Aft of water run onto the valley floor in the Hualapai Valley annually. Of this, 1500 Aft are from Truxton Canyon, immediately adjacent to the valley floor. About 2000 Aft/yr of runoff occur over the 322 square miles of the Sacramento Valley floor. These estimates of annual runoff take into account infiltration losses to stream alluvial deposits.

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*See Appendix D for method discussion.

TABLE II-5

ALLOTMENT AND CUSTODIAL ACREAGE: BY WATERSHED AND SOIL ASSOCIATION, POTENTIAL FOR RUNOFF AND DECREASING RUNOFF WITH THE PROPOSED ACTION[a]

| Allotment | Soil Association | Watersheds[b] Upper Truxton Wash (174 sq mi) | Lower Truxton Wash (72 sq mi) | Music Mountains (64 sq mi) | Hualapai Valley (834 sq mi) | Hualapai Wash (466 sq mi) | Detrital Valley (878 sq mi) | Sacramento Valley (381 sq mi) | West Foothills-Black Mountains (635 sq mi) | Total Acreage per Soil Association | Potential for Runoff (based on annual peak discharge)[c] | Potential for Decreasing Runoff (annually)[d] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7A Big Ranch | 1. Antho-Vint-Gilman | | | | | | | | 18,461 | 18,461 | Moderately low | Slight |
| | 2. Laveen-Rillito-Carrizo-Antho | | | | | | | | 30,769 | 30,769 | Moderately low | Slight |
| | 3. Lomitas-Rock Outcrop-Gachado | | | | | | | | 43,076 | 43,076 | High | Moderate |
| | 4. Anthony-Vinton-Agua | | | | | 12,307 | 92,308 | | | 104,616 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | 24,615 | 110,767 | | 67,691 | 203,073 | High | Slight |
| | 9. Nickel-Rillino-Anthony | | | | | 67,692 | 147,691 | | | 215,383 | Moderately Low | Low |
| | Total Acreage/Watershed | | | | | 104,614 | 350,766 | | 159,997 | 615,378 | | |
| 10A Black Mountain | 4. Anthony-Vinton-Agua | | | | | | | 23,567 | | 23,567 | Moderately low | Low |
| | 6. Cave | | | | | | | 58,917 | | 58,917 | High | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | | 31,815 | 3,535 | 35,350 | High | Slight |
| | Total Acreage/Watershed | | | | | | | 114,299 | 3,535 | 117,834 | | |
| 15A Cane Springs | 4. Anthony-Vinton-Agua | | | | 68,068 | | | | | 68,068 | Moderately low | Low |
| | 10. Tortugas-Purner-Jacks | | | | 140 | | | | | 140 | High | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | 38,258 | | | | | 38,258 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 106,466 | | | | | 106,466 | | |
| 17A Canyon Ranch | 4. Anthony-Vinton-Agua | | | | 26,010 | | | | | 26,010 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | 28,900 | | | | | 28,900 | High | Slight |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | 2,890 | | | | | 2,890 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 57,800 | | | | | 57,800 | | |
| 18A Castle Rock | 4. Anthony-Vinton-Agua | | | | | | | 109 | | 109 | Moderately low | Low |
| | 6. Cave | | | | 434 | | | 1,848 | | 2,282 | High | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | 4,128 | | | 4,345 | | 8,473 | High | Slight |
| | Total Acreage/Watershed | | | | 4,562 | | | 6,302 | | 10,864 | | |
| 19A Cedar Canyon | 4. Anthony-Vinton-Agua | | | | 68,830 | | | | | 68,830 | Moderately low | Low |
| | 10. Tortugas-Purner-Jacks | | | | 141 | | | | | 141 | High | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | 19,413 | | | | | 19,413 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 88,243 | | | | | 88,243 | | |
| 20A Cerbat/ Quail Springs/ Turkey Track | 4. Anthony-Vinton-Agua | | | | | | 19,478 | 9,739 | | 29,217 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | 6,261 | 2,783 | | 9,044 | High | Slight |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | 696 | | 21,565 | 9,043 | | 31,304 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 696 | | 47,304 | 21,565 | | 69,565 | | |
| 23A Clay Springs | 4. Anthony-Vinton-Agua | | | | 6,314 | | | | | 6,314 | Moderately low | Low |
| | 10. Tortugas-Purner-Jacks | | | | 2,835 | | | | | 2,835 | High | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | 3,736 | | | | | 3,736 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 12,885 | | | | | 12,885 | | |
| 26A Crozier Canyon | 5. Latene-Rillino-Cave | 43,554 | | | | | | | | 43,554 | Moderately Low | Moderate |
| | 10. Tortugas-Purner-Jacks | 26,362 | | 3,438 | | | | | | 29,800 | High | Moderate |
| | 11. Cabezon-Rudd-Thunderbird | 29,800 | | | | | | | | 29,800 | High | High |
| | 12. Barkerville-Gaddes-Rock Outcrop | 5,731 | 3,438 | 2,293 | | | | | | 11,462 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | 105,447 | 3,438 | 5,731 | | | | | | 114,616 | | |

TABLE II-5 (Continued)

| Allotment | Soil Association | Watersheds[b] Upper Truxton Wash (174 sq mi) | Lower Truxton Wash (72 sq mi) | Music Mountains (64 sq mi) | Hualapai Valley (834 sq mi) | Hualapai Wash (466 sq mi) | Detrital Valley (878 sq mi) | Sacramento Valley (381 sq mi) | West Foothills-Black Mountains (635 sq mi) | Total Acreage per Soil Association | Potential for Runoff (based on annual peak discharge)[c] | Potential for Decreasing Runoff (annually)[d] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27A Curtain | 4. Anthony-Vinton-Agua | | | | | | | 1,211 | | 1,211 | Moderately low | Low |
| | 6. Cave | | | | | | | 2,459 | | 2,459 | High | Moderate |
| | Total Acreage/Watershed | | | | | | | 3,670 | | 3,670 | | |
| 29A Diamond Bar/ Gold Basin | 4. Anthony-Vinton-Agua | | | | 24,702 | 69,166 | | | | 93,868 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | 17,292 | 22,232 | 7,411 | | | 46,935 | High | Slight |
| | 8. Lithic Torriorthents-Rock Outcrop | | | | | 2,470 | | | | 2,470 | High | None or slight |
| | 9. Nickel-Rillino-Anthony | | | | | 4,940 | 4,940 | | | 9,880 | Moderately low | Low |
| | 10. Tortugas-Purner-Jacks | | | | | 56,815 | 24,702 | | | 81,517 | High | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | | 12,351 | | | | 12,351 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 41,994 | 167,974 | 37,053 | | | 247,021 | | |
| 30A Dolan Springs | 4. Anthony-Vinton-Agua | | | | | 10,956 | 35,060 | | | 46,016 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | 3,652 | 16,069 | | | 19,721 | High | Slight |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | | 5,843 | 1,461 | | | 7,304 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | | 20,451 | 52,590 | | | 73,041 | | |
| 34A Ft. McEwen | 1. Antho-Vint-Gilman | | | | | | | | 19,053 | 19,053 | Moderately low | None or slight |
| | 4. Anthony-Vinton-Agua | | | | | | 26,462 | | 1,058 | 27,520 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | 27,521 | | 31,754 | 59,275 | High | Slight |
| | Total Acreage/Watershed | | | | | | 53,983 | | 51,865 | 105,848 | | |
| 36A Gediondia | 1. Antho-Vint-Gilman | | | | | | | | 1,462 | 1,462 | Moderately low | None or slight |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | 3,967 | 3,549 | 11,901 | 19,417 | High | Slight |
| | Total Acreage/Watershed | | | | | | 3,967 | 3,549 | 13,363 | 20,879 | | |
| 42A Hackberry | 4. Anthony-Vinton-Agua | | 16,703 | | 27,838 | | | | | 44,541 | Moderately low | Low |
| | 5. Latene-Rillino-Cave | | 3,480 | | | | | | | 3,480 | Moderately low | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | 4,872 | | 2,088 | | | | | 6,960 | High | Slight |
| | 10. Tortugas-Purner-Jacks | | | 696 | | | | | | 696 | High | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | | 2,784 | 1,392 | 9,743 | | | | | 13,919 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | 27,839 | 2,088 | 39,669 | | | | | 69,596 | | |
| 55A Mineral Park | 4. Anthony-Vinton-Agua | | | | | | | 8,655 | | 8,655 | Moderately low | Low |
| | 6. Cave | | | | | | | 361 | | 361 | High | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | 541 | | | 8,474 | | 9,015 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 541 | | | 17,490 | | 18,031 | | |
| 56A Mud Springs | 4. Anthony-Vinton-Agua | | | | | | | 28,445 | | 28,445 | Moderately low | Low |
| | 6. Cave | | | | | | | 8,587 | | 8,587 | High | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | 2,147 | 14,491 | | 16,638 | High | Slight |
| | Total Acreage/Watershed | | | | | | 2,147 | 51,523 | | 53,670 | | |
| 57A Music Mountains | 10. Tortugas-Purner-Jacks | | | 16,972 | 2,021 | | | | | 18,993 | High | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | 1,212 | | | | | | 1,212 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | 18,184 | 2,021 | | | | | 20,205 | | |
| 58A Mt. Tipton | 4. Anthony-Vinton-Agua | | | | | | 4,857 | | | 4,857 | Moderately low | Low |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | | | 9,429 | | | 9,429 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | | | 14,286 | | | 14,286 | | |

**TABLE II-5 (Continued)**

| Allotment | Soil Association | Watersheds[b] Upper Truxton Wash (174 sq mi) | Lower Truxton Wash (72 sq mi) | Music Mountains (64 sq mi) | Hualapai Valley (834 sq mi) | Hualapai Wash (466 sq mi) | Detrital Valley (878 sq mi) | Sacramento Valley (381 sq mi) | West Foothills-Black Mountains (635 sq mi) | Total Acreage per Soil Association | Potential for Runoff (based on annual peak discharge)[c] | Potential for Decreasing Runoff (annually)[d] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60A Pine Springs | 4. Anthony-Vinton-Agua | | | | | | | 2,632 | | 2,632 | Moderately low | Low |
| | 6. Cave | | | | | | | 3,350 | | 3,350 | High | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | | 159 | | 159 | High | Slight |
| | 12. Barkerville-Gaddes-Rock Outcrop | | | | | | | 1,834 | | 1,834 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | | | | 7,975 | | 7,975 | | |
| 61A Portland Springs | 1. Antho-Vint-Gilman | | | | | | | | 38,646 | 38,646 | Moderately low | None or slight |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | | | 2,909 | 2,909 | High | Slight |
| | Total Acreage/Watershed | | | | | | | | 41,555 | 41,555 | | |
| 65A Silver Creek | 2. Laveen-Rillito-Carrizo-Antho | | | | | | | | 48,104 | 48,104 | Moderately low | |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | | | 44,403 | 44,403 | High | |
| | Total Acreage/Watershed | | | | | | | | 92,507 | 92,507 | | |
| 66A Stockton Hill | 12. Barkerville-Gaddes-Rock Outcrop | | | | 3,932 | | | | | 3,932 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | | | | 3,932 | | | | | 3,932 | | |
| 68A Thumb Butte | 1. Antho-Vint-Gilman | | | | | | | | 6,907 | 6,907 | Moderately low | None or slight |
| | 2. Laveen-Rillito-Carrizo-Antho | | | | | | | | 5,090 | 5,090 | Moderately low | Slight |
| | 3. Lomitas-Rock Outcrop-Cachado | | | | | | | | 8,725 | 8,725 | High | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | | 364 | 15,269 | 15,633 | High | Slight |
| | Total Acreage/Watershed | | | | | | | 364 | 35,991 | 36,355 | | |
| 70A Truxton Canyon | 4. Anthony-Vinton-Agua | 507 | 1,266 | | | | | | | 1,733 | Moderately low | Low |
| | 11. Cabezon-Rudd-Thunderbird | 1,647 | 633 | | | | | | | 2,280 | High | High |
| | 12. Barkerville-Gaddes-Rock Outcrop | 3,040 | 5,573 | | | | | | | 8,613 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | 5,194 | 7,472 | | | | | | | 12,666 | | |
| 71A Upper Music | 4. Anthony-Vinton-Agua | | | | 2,805 | 468 | | | | 3,273 | Moderately low | Low |
| | 10. Tortugas-Purner-Jacks | | | | 22,442 | 4,207 | | | | 26,649 | High | Moderate |
| | 12. Barkerville-Gades-Rock Outcrop | | | | 16,364 | 468 | | | | 16,832 | Moderately high | Moderate-high |
| | Total Acreage/Watershead | | | | 41,611 | 5,143 | | | | 46,754 | | |
| 24C Cook Canyon | 6. Cave | | | | | | | | 2,495 | 2,495 | High | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | | | 5,065 | 5,065 | High | Slight |
| | Total Acreage/Watershed | | | | | | | | 7,560 | 7,560 | | |
| 32C Feldspar | 4. Anthony-Vinton-Agua | | | | 1,099 | | | | | 1,099 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | 3,481 | | | | | 3,481 | High | Slight |
| | Total Acreage/Watershed | | | | 4,580 | | | | | 4,580 | | |
| 48C Jones Spring | 4. Anthony-Vinton-Agua | | | | | | | 9,819 | | 9,819 | Moderately low | Low |
| | 6. Cave | | | | | | | 5,079 | | 5,079 | High | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | | | | 2,032 | | 2,032 | High | Slight |
| | Total Acreage/Watershed | | | | | | | 16,930 | | 16,930 | | |

TABLE II-5 (Continued)

| Allotment | Soil Association | Watersheds[b]: Upper Truxton Wash (174 sq mi) | Lower Truxton Wash (72 sq mi) | Music Mountains (64 sq mi) | Hualapai Valley (834 sq mi) | Hualapai Wash (466 sq mi) | Detrital Valley (878 sq mi) | Sacramento Valley (381 sq mi) | West Foothills-Black Mountains (635 sq mi) | Total Acreage per Soil Association | Potential for Runoff (based on annual peak discharge)[c] | Potential for Decreasing Runoff (annually)[d] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53C Long Mountain | 4. Anthony-Vinton-Agua | | | | 38,394 | | | | | 38,394 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | 4,745 | | | | | 4,745 | High | Slight |
| | Total Acreage/Watershed | | | | 43,139 | | | | | 43,139 | | |
| 59C Peacock Mountain | 4. Anthony-Vinton-Agua | | | 4,256 | | | | | | 4,256 | Moderately low | Low |
| | 5. Latene-Rillino-Cave | | | 3,082 | | | | | | 3,082 | Moderately low | Moderate |
| | 7. Cellar-House Mountain-Rock Outcrop | | | 7,339 | | | | | | 7,339 | High | Moderate |
| | Total Acreage/Watershed | | | 14,677 | | | | | | 14,677 | | |
| 72C Valentine | 4. Anthony-Vinton-Agua | 474 | 593 | | | | | | | 1,067 | Moderately low | Low |
| | 5. Latene-Rillino-Cave | | 652 | | | | | | | 652 | Moderately low | Moderate |
| | 12. Barkerville-Gaddes-Rock Outcrop | 119 | 4,092 | | | | | | | 4,211 | Moderately high | Moderate-high |
| | Total Acreage/Watershed | 593 | 5,337 | | | | | | | 5,930 | | |
| 74C West Peacock | 4. Anthony-Vinton-Agua | | | | 50,009 | | | | | 50,009 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | 1,745 | | 6,396 | | | | | 8,141 | High | Slight |
| | Total Acreage/Watershed | | 1,745 | | 56,405 | | | | | 58,150 | | |
| 77C Hualapai Ranch | 4. Anthony-Vinton-Agua | | | | 27,842 | | | | | 27,842 | Moderately low | Low |
| | 7. Cellar-House Mountain-Rock Outcrop | | | | 1,777 | | | | | 1,777 | High | Slight |
| | Total Acreage/Watershed | | | | 29,619 | | | | | 29,619 | | |
| Grand Total Acreage/Watershed | | 111,234 | 45,831 | 40,680 | 534,163 | 298,182 | 562,096 | 243,667 | 406,373 | 2,242,246 | | |

a. See Figure II-11 for reference to Watersheds

b. Watersheds are divided on the basis of (a) the contributing drainage area to main streams or washes (i.e., Sacramento, Truxton, Detrital, and Hualapai Washes), (b) the location of continuous or crest-stage recording stations in the ES area. Watersheds A and B are part of Truxton Wash in the Hualapai Valley drainage but have been made separate so that streamflow information for these adjacent areas may be utilized.

c. Potential for runoff (Hydrologic Group under Soil Features and Interpretations – Table II-3) for each soil association is based on such selected soil features as dominant slope, soil texture, permeability, and erosion hazard. It is also based on those soil components making up the greatest part of the soil association.

d. Criteria are based on potential for runoff, use potential for revegetation, soil type distribution, and the proposed action.

e. Total acreage in this allotment includes approximately 2,700 acres of Big Sandy River drainage (on the southern edge).

f. Total acreage in this allotment includes approximately 14,000 acres of the Grand Wash Cliffs/Music Mountains area in the eastern part of the allotment. Drainage is east towards the Grand Canyon.

g. The Wildlife Reserve area contains 5,167 acres of soil type 1, 98,622 acres of soil type 2, and 74,851 acres of soil type 7 for a total of 178,640 acres. This area is not included in the table.

(1) Hualapai Valley. The Hualapai Valley is an area of closed surface drainage and includes a small tributary valley at Hackberry. The principal stream in the valley is Truxton Wash which drains into the playa at Red Lake. Very few floods resulting from high-intensity storms reach Hualapai Valley, and only occasionally do they reach Red Lake where most of the inflow is lost to evaporation and infiltration.

A maximum peak flow of 49,000 cfs occurred on August 2, 1904, at the Valentine gauging station on Truxton Wash. During the USGS study periods (1964-1967), two major flows occurred: a flow of 1120 cfs (December 10, 1965) and a flow of 1960 cfs (August 8, 1966). The December 10 flow was the result of rainfall on top of snow for an extended period of time and it reached Red Lake. The August 8 flow resulted from a high-intensity, short-duration thunderstorm and it did not reach Red Lake.

(2) Sacramento Valley. The Sacramento Valley is drained by Sacramento Wash which joins the Colorado River near Topock, Arizona. Past floods in the wash include the August 2, 1904, flood which destroyed a bridge and 600 feet of railraod near Yucca. On September 6, 1939, a peak flow of 15,000 cfs occurred at the mouth of the wash. During the USGS study of the area, a peak flow of 2060 cfs, or about 1200 Aft, occurred December 9-10, 1965. Most of the tributary flow originated in streams draining the Black Mountains.

Estimated mean annual flow at Sacramento Wash near Yucca is about 4000 feet (Moore's method), which corresponds favorably to the 500 Aft value arrived at using the short-term data from the gauging station near Yucca.

Springs in the Hualapai and Sacramento valleys issue from igneous, metamorphic, and volcanic rocks in the mountain areas. About 130 springs[19] and seeps are known to be in the upland positions that drain toward the Hualapai and Sacramento valleys. No springs are known to issue from the alluvium on the valley floors.

According to Gillespie and Bentley,[20] the median spring discharge of 130 springs is about two gallons per minute with an estimated 950 Aft of water discharge per year. Specific data on use of this discharge are lacking. The most knowledgeable opinions indicate that possibly half of this water is used by ranchers, mainly for livestock, and by wildlife. Probably less than one-fourth of the annual spring discharge is recharged to the groundwater reservoir in the valleys; the rest is lost, through evapotranspiration, to the atmosphere.

d. Water Quality

Water quality in the region is generally good except for mineralized areas in the mountain areas. The data on water quality presented in Table II-6 are abstracted directly from open-file data available from the USGS and supplemental data for waters in the Hualapai and Sacramento valleys that appear in Gillespie and Bentley.[21]

## TABLE II-6

### WATER QUALITY DATA FROM SELECTED WELLS IN THE CERBAT MOUNTAIN PROJECT AREA, MOHAVE COUNTY, ARIZONA

| Location | Date of Sample | Depth (ft) | Temp (c) | Specific Conductance (micro-mhos) | pH | Carbon Dioxide ($CO_2$) (mg/l) | Alkalinity as $CACO_3$ (mg/l) | Bicarbonate ($HCO_3$) (mg/l) | Carbonate ($CO_3$) (mg/l) | Dissolved Nitrate ($NO_2$) (mg/l) | Hardness (CA, mg) (mg/l) | Noncarb. Hardness (mg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (B-17-16)4dd | 62-04-27 | - | - | - | - | - | - | 223 | 9 | 2.0 | 312 | - |
| (B-17-17)31bcb | 65-06-10 | 460 | - | 582 | 7.9 | - | - | 150 | 0 | 6.4 | 196 | - |
| (B-17-17)31cbb | 65-06-10 | - | - | - | - | - | - | 150 | 0 | 6.4 | 196 | - |
| (B-17-18)12bca | 65-04-27 | 1,004 | 33.5 | 480 | 7.5 | 9.0 | 146 | 178 | 0 | 10.0 | 140 | 0 |
| (B-17-18)12bcb | 61-06-17 | 784 | - | - | - | - | - | 183 | 0 | - | 159 | 0 |
| (B-19-19)17baa | 66-01-10 | 370 | - | 383 | 9.6 | .1 | 172 | 96 | 56 | - | 7 | 0 |
| | 66-06-06 | 370 | 29.0 | 376 | 9.5 | .1 | 167 | 96 | 53 | .4 | 3 | 0 |
| | 66-06-07 | 370 | 31.0 | 375 | 9.5 | .1 | 167 | 98 | 52 | .5 | 2 | 0 |
| (B-20-15)5bb | 65-06- | 785 | - | 878 | 7.7 | - | - | 336 | 0 | - | 364 | - |
| (B-20-16)2adc | 65-06- | - | - | 716 | 7.4 | - | - | 321 | 0 | - | 312 | - |
| (B-20-18)04bbbd | 67-03-07 | 1,350 | - | 528 | 7.8 | 3.9 | 126 | 154 | 0 | - | 142 | 16 |
| (B-20-19)4abb | - | - | - | - | - | - | - | - | - | - | 142 | - |
| (B-21-15)19acd | 65-06- | 152 | - | 1,590 | 7.8 | - | - | 298 | 0 | - | 618 | - |
| (B-21-15)33bbb | 65-06- | 700 | - | 2,290 | 7.2 | - | - | 230 | 0 | - | 1,040 | - |
| (B-21-16)20c | 65-08-11 | 485 | - | 370 | - | - | - | 120 | 0 | 2.0 | 136 | - |
| (B-21-17)1cab | 63-09-11 | 503 | - | - | - | - | - | 180 | 0 | 9.0 | 250 | 0 |
| (B-21-17)3dc3 | 64-11-10 | 186 | - | 476 | - | - | - | 204 | 0 | 6.0 | 220 | - |
| (B-21-17)24cda | 62- | 178 | - | - | - | - | - | - | - | 15.0 | 270 | - |
| (B-21-17)24cbc | 64-11-10 | - | - | - | - | - | - | 208 | 2 | 9.0 | 270 | - |
| (B-21-17) 24cdb | 64-11-10 | 232 | - | - | - | - | - | 200 | 12 | 7.0 | 260 | 0 |
| (B-21-17)24cdd | 64-11-10 | - | - | - | - | - | - | 124 | 0 | 14.0 | 210 | 0 |
| (B-21-18)9bbac | 63-03-14 | 1,518 | - | - | - | - | - | 120 | 0 | 6.0 | 194 | 0 |
| (B-21-18)9bbb | 66-05-10 | 1,518 | - | 790 | 8.0 | 2.5 | 127 | 155 | 0 | - | 224 | 9 |
| (B-21-18)20ccaad | 67-03-07 | 1,285 | - | 723 | 7.6 | 6.0 | 123 | 150 | 0 | - | 240 | 117 |
| (B-21-18)30abbd | 67-03-07 | 1,385 | - | 430 | 7.7 | 5.4 | 139 | 170 | 0 | - | 128 | 0 |
| (B-21-18)32bbbd | 67-03-07 | 1.355 | - | 477 | 7.7 | 5.2 | 133 | 162 | 0 | - | 132 | 0 |
| (B-21-18)32dccd | 67-03-07 | 1,350 | - | 548 | 7.7 | 4.7 | 121 | 148 | 0 | - | 148 | 27 |
| (B-21-19)32 | - | - | - | - | - | - | - | - | - | - | 128 | - |
| (B-21-19)20 | - | - | - | - | - | - | - | - | - | - | 148 | - |
| (B-22-15)33dad | 65-04-24 | 1,220 | - | - | 8.2 | 1.8 | 144 | 176 | 0 | 12.0 | 58 | 0 |
| | 65-06-10 | 1,220 | - | - | - | - | - | 176 | 0 | 12.0 | 58 | 0 |
| (B-22-16)26bac | 67-02-10 | 1,247 | - | 324 | 7.7 | 5.2 | 135 | 164 | 0 | - | 98 | 0 |
| (B-22-16)28acc | 64-01-09 | 1,000 | - | - | - | - | - | 152 | 0 | 8.0 | 150 | 0 |
| (B-22-17)31abb2 | 63-03-07 | 70 | - | 548 | 7.7 | - | - | 308 | - | 5.0 | 340 | - |
| (B-22-18)12caa | 64-01-08 | 50 | - | - | - | - | - | 390 | 0 | - | 499 | 0 |
| (B-23-13)19cbb | 64-11-10 | 150 | - | 588 | - | - | - | 172 | 4 | 5.0 | 210 | 0 |
| (B-23-13)19dda | 64-11-10 | 1,072 | - | 548 | - | - | - | 174 | 10 | 2.0 | 168 | 0 |
| (B-23-13)20ccd | 64-11-10 | 355 | - | 676 | - | - | - | 228 | 8 | 8.0 | 260 | - |
| (B-23-13)29aaa | 43-10-13 | 40 | - | 105 | - | - | 355 | 0 | - | - | - | - |
| (B-23-13)29dbc1 | 43-11-25 | 272 | - | - | - | - | - | - | - | - | - | - |
| | 43-11-26 | 272 | - | 66 | - | - | - | - | - | - | - | - |
| (B-23-13)29dbc2 | 64-11-10 | 272 | - | - | - | - | 240 | 12 | - | 2.0 | - | - |
| (B-23-14)3adc | 43-11-13 | 515 | - | - | - | - | 225 | 0 | - | - | - | - |
| (B-23-14)13ccb1 | 43-10-13 | 103 | 17.7 | 104 | - | - | 326 | 0 | - | - | - | - |
| (B-23-14)14ddd2 | 43-11-24 | 75 | - | 106 | - | - | - | - | - | - | - | - |
| (B-23-15)8ddd | 65-03-05 | 929 | - | - | - | - | - | 132 | - | 7.0 | 158 | - |
| (B-23-18)3adb | 62-01-01 | 145 | - | - | - | - | - | - | - | - | - | - |
| | 65-01-01 | 145 | - | - | - | - | 159 | 5 | - | - | - | - |
| (B-23-18)3cbb | 62-01-01 | 104 | - | - | - | - | - | - | - | 150.0 | 765 | - |
| (B-23-18)3bc | 64-7-14 | 210 | - | - | - | - | - | 304 | - | - | 1,067 | - |
| (B-23-18)9 | 65-10-11 | 104 | - | 2,632 | - | - | - | 232 | - | 13.0 | 1,120 | - |
| (B-24-16)1ddd | 67-02-15 | - | 29.0 | 573 | 7.8 | 4.2 | 164 | 0 | - | - | - | - |
| (B-25-16)30cda | 67-03-09 | 600 | 22.0 | 629 | 7.9 | 4.8 | 240 | 0 | - | - | - | - |
| (B-25-16)30cda | 72-03-09 | - | 23.0 | 641 | 7.8 | 6.1 | 198 | 241 | 0 | - | 210 | 8 |
| (B-26-14)9c | 69-10-08 | - | 16.5 | 478 | 8.2 | 3.0 | 242 | 295 | 0 | - | 250 | 0 |
| (B-26-17)35aaa | 67-03-09 | 800 | - | 1,320 | 7.8 | 1.8 | 59 | 72 | 0 | - | 75 | 16 |
| | 72-02-01 | - | 23.0 | 595 | 8.6 | .5 | 103 | 120 | 0 | - | 18 | 0 |
| (B-28-17)31ccc | 65-05-07 | 800 | - | 2,210 | 9.5 | .1 | 167 | 120 | 3 | .40 | 14 | 0 |
| | 65-05-10 | 800 | - | - | - | - | - | 120 | 41 | .40 | 14 | 0 |
| | 67-02-15 | 800 | - | 2,670 | 8.6 | 1.1 | 220 | 244 | 41 | - | 52 | 0 |
| (B-29-22)29dcc2 | 70-09-28 | - | - | 1,680 | - | - | 171 | 209 | 12 | - | 430 | 259 |
| (B-30-16)7bdd | 75-01-21 | - | - | 725 | 8.0 | 3.8 | 195 | 238 | 0 | 22. | 280 | 87 |
| (B-30-17)7baa | 76-02-09 | - | 27.0 | 4,000 | 7.8 | 5.9 | 190 | 232 | - | - | 430 | 240 |
| (B-30-17)23ccb | 74-10-06 | - | - | - | 7.3 | 13. | 138 | 168 | 0 | - | 116 | 0 |
| | 74-10-07 | - | - | - | - | - | 128 | 156 | 0 | 4.0 | 148 | 20 |
| (B-30-20)6bdd | 72-03-01 | - | 24.0 | 1,710 | 7.5 | 8.0 | 130 | 158 | 0 | - | 520 | 390 |
| (B-30-22)13ada | 72-02-18 | - | 17.0 | 674 | 7.3 | 24. | 247 | 36 | 0 | - | 280 | 29 |
| (B-31-19)32ada | 67-06-21 | 200 | 24.0 | 688 | 8.0 | 2.5 | 126 | 154 | 0 | - | 170 | 44 |
| | 72-02-17 | - | 23.5 | 788 | 7.6 | 5.7 | 116 | 142 | 0 | - | 210 | 97 |
| (B-31-19)32daa | 75-11-12 | - | 24.0 | 750 | 7.7 | 4.5 | 116 | 141 | 0 | - | 130 | 14 |
| (B-31-19)33acc2 | 72-03-01 | - | 26.0 | 2,510 | 7.8 | 2.6 | 83 | 101 | 0 | - | 560 | 480 |

**Source:** U.S. Geological Survey.

| Dissolved Calcium (CA) (mg/l) | Dissolved Magnesium (MG) (mg/l) | Dissolved Sodium (NA) (mg/l) | Sodium Adsorption Ratio | Percent Sodium | Dissolved Sodium and Potassium (mg/l) | Dissolved Potassium (K) (mg/l) | Dissolved Chloride (CL) (mg/l) | Dissolved Sulfate ($SO_4$) (mg/l) | Dissolved Fluoride (F) (mg/l) | Dissolved Silica ($SiO_2$) (mg/l) | Dissolved Boron (B) ($\mu$g/l) | Dissolved Iron (Fe) ($\mu$g/l) | Dissolved Solids (sum of Constituents) (mg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 74.0 | 30.0 | - | - | - | - | 60.0 | 17.0 | 184.0 | 3.8 | - | - | - | 563 |
| 42.0 | 22.0 | - | 1.3 | 32 | - | 42.0 | 63.0 | 65.0 | .9 | 37 | - | - | 352 |
| 42.0 | 22.0 | - | - | - | 42.0 | - | 63.0 | 65.0 | .9 | - | - | 10.0 | 352 |
| 26.0 | 18.0 | - | 1.7 | 42 | 46.0 | - | 42.0 | 25.0 | .8 | 37 | - | - | 293 |
| 26.0 | 23.0 | - | - | - | 39.0 | - | 46.0 | 27.0 | 1.2 | - | - | - | 344 |
| 2.8 | 0 | - | - | - | 93.0 | - | 14.0 | 12.0 | 2.7 | - | - | 400.0 | - |
| .8 | .2 | 87 | 23.0 | 97 | - | 1.9 | 11.0 | 8.6 | 2.7 | 68 | - | 140.0 | 281 |
| .6 | .2 | 87 | 25.0 | 98 | - | 1.6 | 11.0 | 8.4 | 2.6 | 68 | - | 80.0 | 280 |
| 68.0 | 47.0 | - | 1.2 | 24 | 53.0 | - | 61.0 | 113.0 | 2.8 | - | - | 0.02 | 509 |
| 79.0 | 28.0 | - | .1 | 4 | 5.5 | - | 47.0 | 43.0 | 2.6 | - | - | 0.01 | 365 |
| 34.0 | 14.0 | 51 | 1.9 | - | - | - | 44.0 | 61.0 | .7 | 47 | - | 0 | 328 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | 135 |
| 93.0 | 94.0 | - | 1.8 | 26 | 102.0 | - | 265.0 | 213.0 | 3.5 | - | - | 4.4 | 922 |
| 254.0 | 99.0 | - | 1.3 | 16 | 94.0 | - | 416.0 | 450.0 | 2.0 | - | - | 0.01 | 1,430 |
| 21.0 | 20.0 | - | - | - | 18.0 | - | 26.0 | 20.0 | 1.1 | - | - | 1.8 | 221 |
| 48.0 | 31.0 | - | - | - | 12.0 | - | 6.0 | 12.0 | .4 | - | - | - | 503 |
| 45.0 | 26.0 | - | - | - | 11.0 | - | 15.0 | 10.0 | .4 | - | - | 0 | 322 |
| 66.0 | 25.0 | - | - | - | 25.0 | - | 48.0 | 31.0 | .8 | - | - | - | 391 |
| 58.0 | 30.0 | - | - | - | 26.0 | - | 41.0 | 29.0 | .6 | - | - | - | 390 |
| 62.0 | 25.0 | - | - | - | 27.0 | - | 51.0 | 28.0 | 1.0 | - | - | - | 422 |
| 45.0 | 24.0 | - | - | - | 26.0 | - | 65.0 | 34.0 | .9 | - | - | - | 376 |
| 47.0 | 18.0 | - | - | - | 79.0 | - | 56.0 | 162.0 | .6 | - | - | 200.0 | 487 |
| 54.0 | 22.0 | - | 2.4 | 44 | 82.0 | - | 65.0 | 176.0 | .3 | - | - | - | 475 |
| 57.0 | 24.0 | - | - | - | 55.0 | - | 74.0 | 125.0 | .7 | 36 | - | 0 | 446 |
| 33.0 | 11.0 | - | - | - | 40.0 | - | 29.0 | 32.0 | .8 | 61 | - | 20.0 | 291 |
| 32.0 | 13.0 | - | - | - | 46.0 | - | 35.0 | 46.0 | .8 | 55 | - | 0 | 308 |
| 36.0 | 14.0 | - | - | - | 50.0 | - | 46.0 | 67.0 | .8 | 43 | - | 0 | 330 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | 1,385 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | 1,255 |
| 15.0 | 5.0 | - | 4.7 | 76 | 83.0 | - | 30.0 | 38.0 | 1.2 | 31 | - | - | 302 |
| 15.0 | 5.0 | - | - | - | 83.0 | - | 30.0 | 38.0 | 1.2 | - | - | - | 302 |
| 16.0 | 14.0 | - | - | - | 32.0 | - | 11.0 | 13.0 | 1.7 | 26 | - | 0 | 195 |
| 29.0 | 19.0 | - | - | - | 30.0 | - | .5 | 13.0 | .9 | - | - | - | 282 |
| 82.0 | 33.0 | - | - | - | 150.0 | - | 110.0 | 215.0 | 1.2 | - | - | 0.4 | 839 |
| 122.0 | 47.0 | - | - | - | 116.0 | - | 88.0 | 295.0 | 1.1 | - | - | - | 1,058 |
| 30.0 | 32.0 | - | - | - | 42.0 | - | 52.0 | 36.0 | .5 | - | - | 900.0 | 415 |
| 40.0 | 17.0 | - | - | - | 47.0 | - | 46.0 | 26.0 | .5 | - | - | - | 358 |
| 50.0 | 33.0 | - | - | - | 45.0 | - | 58.0 | 39.0 | .5 | - | - | 0 | 444 |
| - | - | - | - | - | - | - | 119.0 | - | - | - | - | - | - |
| - | - | - | - | - | - | - | 73.0 | - | - | - | - | - | - |
| 0 | - | - | - | - | - | - | 73.0 | - | - | - | - | - | - |
| 69.0 | 28.0 | - | - | - | 42.0 | - | 66.0 | 37.0 | .4 | - | - | 200.0 | 486 |
| 0 | - | - | - | - | - | - | 127.0 | 78.0 | - | - | - | - | - |
| 93.0 | 54.0 | - | - | - | 43.0 | - | 127.0 | 98.0 | .5 | - | - | - | 576 |
| - | - | - | - | - | - | - | 141.0 | - | - | - | - | - | - |
| 43.0 | 9.0 | - | - | - | 100.0 | - | 57.0 | 45.0 | 1.7 | - | - | .2 | 344 |
| 200.0 | 84.0 | - | - | - | 53.0 | - | 50.0 | 475.0 | 2.2 | - | - | - | 1,674 |
| 136.0 | 51.0 | - | - | - | 68.0 | - | 72.0 | 435.0 | 1.0 | - | - | - | 847 |
| 200.0 | 34.0 | - | - | - | 225.0 | - | 264.0 | 460.0 | 1.7 | - | - | - | 1.431 |
| 260.0 | 101.0 | - | - | 21 | 127.0 | - | 324.0 | 610.0 | 1.0 | - | - | - | 1,726 |
| 272.0 | 106.0 | - | - | - | 195.0 | - | 38.0 | 1,000.0 | 2.3 | 2.0 | - | - | 2,365 |
| 30.0 | 24.0 | - | - | - | 49.0 | - | 75.0 | 34.0 | 1.8 | 30.0 | - | 10.0 | 325 |
| 35.0 | 29.0 | - | - | - | 58.0 | - | 59.0 | 51.0 | .9 | 28.0 | - | 30.0 | 379 |
| 38.0 | 27.0 | 51 | 1.5 | 34 | - | 5.1 | 56.0 | 56.0 | .6 | 33.0 | 50 | 50.0 | 389 |
| 13.0 | 52.0 | 12 | .3 | 9 | - | 2.1 | 14.0 | 25.0 | .1 | 14.0 | - | 10.0 | 284 |
| 25.0 | 3.0 | - | - | - | 234.0 | - | 355.0 | 17.0 | 2.6 | 16.0 | - | 0 | 688 |
| 5.9 | .8 | 120 | 12.0 | 93 | - | 1.5 | 100.0 | 18.0 | 4.0 | 15.0 | 190 | 30.0 | 331 |
| 3.6 | 1.2 | - | 53.0 | 99 | 460.0 | - | 528.0 | 95.0 | 1.2 | 6.3 | 550 | - | 1,200 |
| 3.6 | 1.2 | - | - | - | 460.0 | - | 528.0 | 95.0 | 1.2 | - | - | - | 1,200 |
| 8.8 | 7.3 | - | - | - | 560.0 | - | 645.0 | 130.0 | 1.7 | 18.0 | - | 10.0 | 1,500 |
| 118.0 | 33.0 | 193 | 4.0 | 49 | - | 6.2 | 128.0 | 440.0 | .9 | 27.0 | - | - | 1,050 |
| 47.0 | 40.0 | 34 | .9 | 20 | - | 4.3 | 65.0 | 56.0 | .7 | 30.0 | 140 | 40.0 | 417 |
| 91.0 | 49.0 | 560 | 12.0 | 73 | - | 20.0 | 900.0 | 180.0 | 4.8 | 27.0 | 760 | 10.0 | 1,960 |
| 23.0 | 14.0 | 49 | 2.0 | - | - | - | 54.0 | 42.0 | 2.0 | - | - | - | - |
| 28.0 | 19.0 | 35 | 1.3 | - | - | - | 52.0 | 17.0 | 1.0 | - | - | - | - |
| 140.0 | 42.0 | 150 | 2.9 | 38 | - | 7.9 | 160.0 | 470.0 | 1.2 | 42.0 | - | 10.0 | 1,150 |
| 76.0 | 21.0 | 34 | .9 | 20 | - | 9.7 | 32.0 | 57.0 | .5 | 44.0 | - | 10.0 | 429 |
| 50.0 | 11.0 | - | - | - | 81.0 | - | 36.0 | 160.0 | .8 | 21.0 | - | 0 | 436 |
| 64.0 | 13.0 | 76 | 2.3 | 43 | - | 3.9 | 40.0 | 210.0 | .5 | 24.0 | - | 10.0 | 506 |
| 39.0 | 7.8 | 110 | 4.2 | 64 | - | 3.3 | 35.0 | 190.0 | .7 | 21.0 | 460 | 310.0 | 480 |
| 150.0 | 45.0 | 340 | 6.3 | 57 | - | 7.5 | 250.0 | 760.0 | .8 | 23.0 | - | 10.0 | 1,710 |

In general, most of the waters in the region contain total dissolved solids contents of less than 500 milligrams per liter and are suitable as domestic supplies. Local accumulations of highly mineralized water occur in the mountains, primarily in the vicinity of mineral deposits.

In general, as the water moves from the mountain areas toward the valleys in the subsurface, the total dissolved solids content decreases as a result of dilution by infiltrating surface water. Once in the major basins, the dissolved solids content gradually increases as the water moves down gradient toward the outlets from the basins as the result of dissolution of salts and minerals from the aquifer rocks. Gillespie and Bentley[22] document that typical water in the area changes from sodium-calcium-bicarbonate to sodium-chloride water as it flows through the groundwater basins.

Data on the subsurface geology in the area document the existence of thick deposits of salt below the older alluvium. For example, Gillespie and others[23] report that two test holes drilled by the Kerr-McGee Corporation south of Red Lake in the Hualapai Valley penetrated more than 1000 feet of these salts at depths as close as 1450 feet below the land surface. With such deposits in the area, it is certain that water quality within the basins decreases with depth.

Water quality data are unavailable for any of the watersheds because surface streamflow within the ES area is intermittent and sporadic and therefore has not been mentioned.

There are no large agricultural areas located on major watersheds within the ES area that would contribute to the pollution potential of runoff water that goes to groundwater recharge or drains into areas utilized for recreation.

Any water quality problems within the ES area would be of a highly localized nature -- for example, livestock and wildlife fecal pollution of water around built water supplies. Such supplies are not for human consumption and all tanks or similar facilities are sealed against seepage.

## 5. Vegetation*

### a. General Description and Phenology

(1) Vegetational Formations. One of the distinctive features of desert plant communities is the often gradual replacement of one key species by another, intergrading community types in response to the slightest changes in soil moisture and substrate texture, depth, and mineral content.[1] Of the 19 BLM vegetation subtypes,[2] 15 are found within the ES area. Of these, four are special categories. The other 11 subtypes are keyed within the natural vegetation classification system of Arizona as devised by Brown and Lowe[3] (Table II-7). Within the ES area, the rugged topography and an elevational gradient from 1000 feet in the southwestern corner to 7148 feet on Mt. Tipton combine with soil and moisture regimes to provide habitats for five vegetational formations and the transitions occuring in species composition between them. These formations are Desertscrub, Grassland, Scrubland, Woodland, and Forest. (See Figure II-13.)

Important communities within each formation have been defined for the ES area following the Brown and Lowe classification system.[4]** It is important that the ES area be studied in terms of natural communities. The interrelationships which occur between all the plants and animals in their native habitats are delicately complex and those components supposedly most affected by grazing cannot be extracted from the whole intricately interwoven system.

Local dominants shift continually in intricate mosaic patterns, as noted especially along the upper edge of the valley alluvium. This has been a confusing factor in community delineation for range management analysts of the BLM, as it has been classically for plant geographers.[5] Only significant associations within the communities are discussed. Appendix E lists all vascular plant species (with their common names) known to occur within the study area, as verified by herbarium specimens.

(a) Desertscrub Formation. This formation includes, for the ES area, a major portion of the Mohave Desertscrub and a small section of the Sonoran Desertscrub biomes.

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*References for this subsection follow on page II-238.

**As noted in Brown and Lowe, the structure of the fifth and sixth level (communities and associations) could be subjected to interpretive revision and modification as field investigations accumulated. No attempt was made to complete this level of classification in their publications. Therefore, communities and associations are presented in this study which are compatible with the situation as it exists in the ES area. This has resulted in change of rank in some cases (e.g., an association elevated to community level or *vice versa*) or change of position within the same rank (community presented in a different biome).

## TABLE II-7

### CLASSIFICATION OF THE NATURAL VEGETATION OF THE SOUTHWEST WITH PARTICULAR REFERENCE TO ARIZONA KEYED TO BLM VEGETATION SUBTYPES

| BLM Classification | Brown and Lowe Classification |
|---|---|
| Type 6 – Conifer | Forest Formation |
| | Temperate Forest |
| | Montane Conifer |
| | Pine Communities |
| | *Pinus ponderosa* Associations |
| Type 9 – Pinyon-Juniper | Woodland Formation |
| | Temperate Woodland |
| | Rocky Mountain Conifer Woodland |
| | Pinyon-Juniper Communities |
| | *Juniperus* Associations |
| | *Pinus monophylla* Associations |
| Type 5 – Mountain Shrub | Scrubland Formation |
| | Temperate Scrubland (Chaparral) |
| | Interior Chaparral |
| | Evergreen Sclerophyll Communities |
| | *Quercus turbinella* Associations |
| | *Ceanothus greggii* Associations |
| Type 1 – Grass | Grassland Formations |
| Type 17 – Half-shrub | Temperate Grassland |
| | Plains Grassland |
| | Grama Grass Communities |
| | *Bouteloua gracilis* and *Bouteloua eriopoda* Associations |
| | Galleta and Tobosa Grass Communities |
| | Mixed Grass Communities |
| | *Aristida, Andropogon, Bouteloua, Sporobolus,* and *Eragrostis* Associations |
| | Shrub-Grass Disclimax Communities |
| | *Aplopappus* Associations |
| | *Gutierrezia* Associations |
| | *Salsola kali* Associations |
| | Desert Grassland (Scrub Grassland) |
| | Grama Grass-Scrub Communities |
| | Tobosa and Galleta Grass-Scrub Communities |
| | Sacaton Grass-Scrub Communities |
| | Bear Grass-Scrub Communities |
| | Mixed Grass-Scrub Communities |
| | Shrub-Grass Scrub Disclimax Communities |
| Type 4 – Sagebrush | Temperate Desertscrubland |
| Type 11 – Creosote Bush | Mohave Desertscrub |
| Type 12 – Mesquite | Creosote Bush Communities |
| Type 13 – Saltbush | Joshua Tree Communities |
| Type 15 – Winter Fat | Blackbrush Communities |
| Type 16 – Desert Shrub | Saltbush Communities |
| | Shadscale Communities |
| | Wolfberry Communities |
| | Mohave Thorn Communities |
| | Winter Fat Communities |
| | Riparian Desertscrub Communities |
| | Sagebrush-Great Basin Desertscrub-like Communities |
| | Subtropical Desertscrubland |
| | Sonoran Desertscrub |
| | Creosote Bush-Bur Sage (Lower Colorado Valley) Communities |
| | Riparian Desertscrub Communities |
| Special Categories: | |
| Type 7 – Waste | |
| Type 8 – Barren | |
| Type 18 – Annuals | |
| Type 19 – Cropland | |

**Sources:** Brown and Lowe; American Ag International; Arthur D. Little, Inc.; Museum of Northern Arizona.

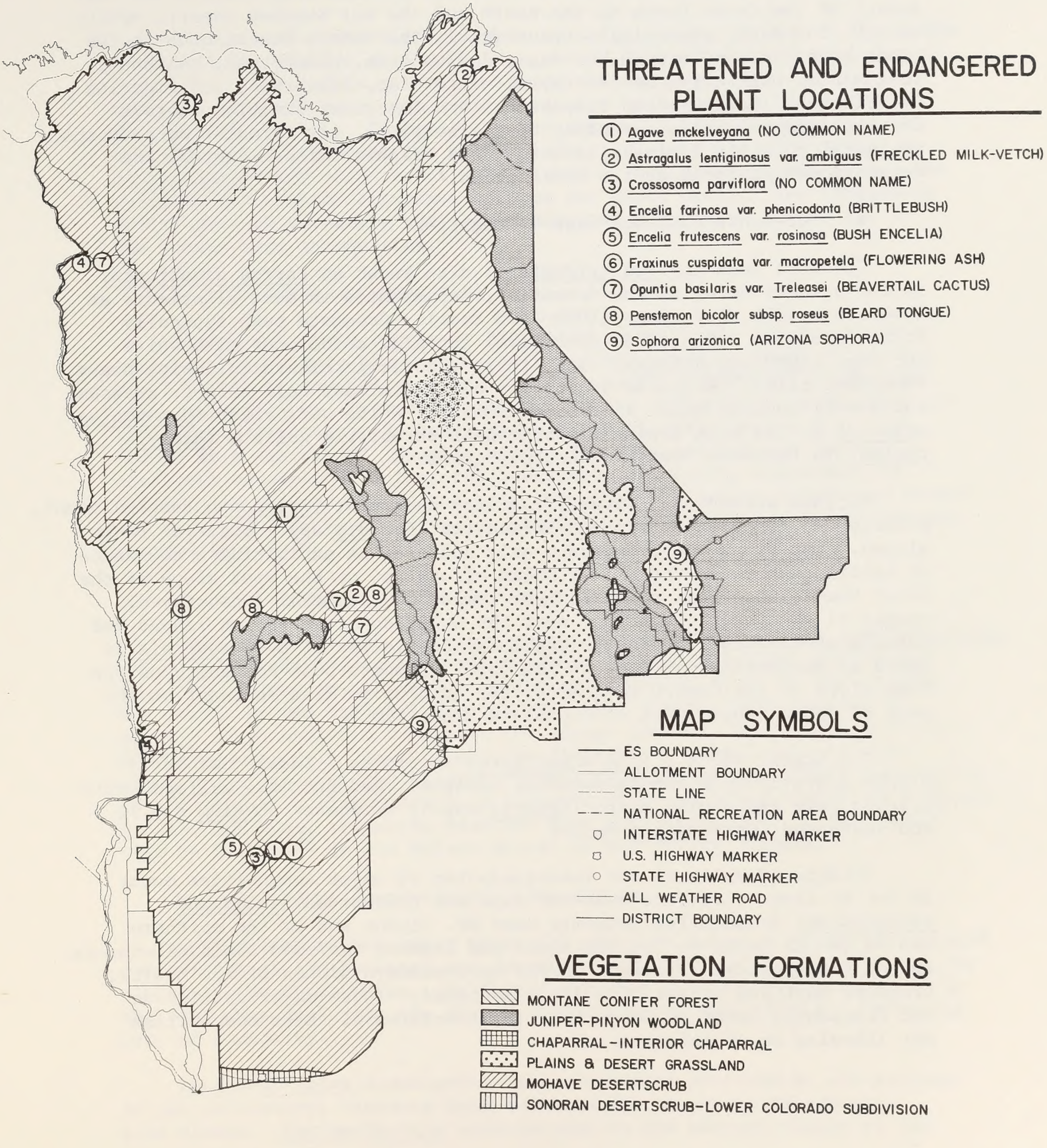


**FIGURE II-13 VEGETATIVE FORMATIONS – ES STUDY AREA**

The Mohave Desertscrub Biome is a transitional area between the cool desert of the Great Basin to the north and the hot Sonoran Desert, southward.[6] Ten major communities occur within the Mohave Desertscrub in the study area: creosote bush-bur sage, Joshua tree, blackbrush, saltbush, shad scale, wolfberry, Mohave thorn, winter fat, sagebrush, and riparian desertscrub. Moisture and temperature are important limiting factors for the desert species depending upon elevation. Air circulation patterns, nocturnal cold air drainage patterns, and edaphic factors control the vegetational patterns of the basin areas.[7]

- Creosote Bush-Bur Sage Communities

Creosote bush (Larrea tridentata; also known as Larrea divaricata) is the primary shrub of the formation, represented in most allotments at lower to middle elevations (1000-4500 feet). Creosote bush typically forms extensive open stands over level terrain, codominant with white bur sage (Ambrosia dumosa). Both these species germinate following heavy September rains.[8] A sparse understory of subdominant half-shrubs, grasses, and annual species occur in this community. White burrobrush (Hymenoclea salsola) is the most frequent subdominant shrub; big galleta (Hilaria rigida) is the most common understory grass.

Various buckwheats, notably flat-top buckwheat (Eriogonum fasciculatum), brittlebush (Encelia spp.), and Mormon tea (Ephedra spp.) occur on rocky slopes. The BLM surveys indicate only one area as exhibiting a dominance of brittlebush -- in the Silver Creek allotment, on the west slope of the Black Mountains. This shrub is most common on ephemeral (unsurveyed) ranges at the lower elevations near the Colorado River and on ledges and talus slopes below 2000 feet. One local population of E. nevadensis is noted as dominating portions of the upper creosote bush community on the west slope of the Cerbat Mountains; the species is also dominant on the mesa of the southern part of the Black Mountains.

The Mohave Yucca (Yucca schidigera) occurs as a local dominant at higher elevations in the Sacramento, Hualapai, and Detrital valleys with prickly pear and cholla cacti (Opuntia spp.), wolfberry (Lycium spp.), and snakeweed (Gutierrezia spp.).

Notable examples of the intergradation of major communities occur in the ES area. Creosote bush-bur sage and blackbrush (Coleogyne ramosissima) communities intermix near Mt. Tipton and at the northern end of the ES area, in the Big Ranch and Diamond Bar/Gold Basin allotments. In the Clay Springs allotment on the northwestern slopes of the Musics, creosote bush and pinyon pine are associated. These major species do not frequently occur as codominants;[9] associates of these communities may likewise be of interest.

- Joshua Tree Communities

Extensive forests of the Joshua tree (Yucca brevifolia) occur in the north central portion of the ES area, north of Red Lake and southeast of the White Hills. This community intergrades with the upper elevation creosote bush-bur sage communities and also with communities of the Grassland Formation. Commonly, an understory of blackbrush, creosote bush, flat-top buckwheat (on rocky slopes), or golden cholla (Opuntia acanthocarpa) and other cacti subdominates. Cooler temperatures and the sporadic but common occurrence of snow for short periods are considered normal and are necessary for the survival of the indicator species of the Joshua tree communities.[10,11]

- Blackbrush Communities

Blackbrush, more common in the cooler Great Basin Desert, tends to occur as nearly pure stands (the only species really common) on upper bajadas within closed basins at middle to higher elevations (2500-5500 feet) generally on limey or calcareous soils. Blackbrush seeds germinate following extraordinarily heavy March rains of a kind which occur but rarely in a century.[12] Usually Mohave Yucca is subdominant with a scattered understory of flat-top buckwheat, wolfberry, snakeweed, or Mormon tea. The occurrence of snow for short periods is considered normal and necessary for the survival of the indicator species of the blackbrush communities.[13,14]

- Saltbush and Shadscale Communities

Four-wing saltbush (Atriplex canescens) and shadscale (A. confertifolia) are well represented on the western slope of the Grand Wash Cliffs and Music Mountains, on calcareous and/or saline sandy soils of the bajadas and playas of the Hualapai Valley (3000-4000 feet). Both species of Atriplex have common subdominants of desert grasses, buckwheat, wolfberry, winter fat (Eurotia lanata), and the disturbance-indicators, filaree (Erodium cicutarium) and Russian thistle (Salsola kali). These communities do not appear to significantly intergrade with the other communities present in the same areas (creosote bush-bur sage and blackbrush), a fact noted also by Beatley[15] in the Mohave Desert of Nye County, Nevada.

- Wolfberry (Desertthorn) Communities

Lycium communities occur above the creosote bush-bur sage and saltbush communities of the Hualapai and Sacramento valleys and northward along the slopes of the White Hills. Wolfberry has been noted as "desert-scrub" by the BLM; when dominant, the thorny shrub thickets do approach a chaparral form of community.

Lycium-Atriplex associations include desert half-shrubs and grasses in the understory; creosote bush subdominates in the lower and more open stands. Lycium-Eurotia associations on the western slopes of the

Cerbats appear as thickets. In more open areas, white burrobush, rayless goldenweed (*Acamptopappus sphaerocephalus*), and cacti occur as subdominants. An unusual wolfberry-Whipple's cholla (*Opuntia whipplei*) assemblage occurs on the western slope of the Music Mountains in the Cedar Canyon allotment; the wolfberry-pencil cactus (*Opuntia ramosissima*) assemblage on Big Ranch is likewise unique.

- Mohave Thorn Communities

*Canotia holocantha*, a tall loose shrub with spine-tipped branches, reaches its northern range limits in Mohave County, seldom occurring in large populations. It occurs on the upper bajadas and hillsides at the southern end of the Music Mountains with typical desertscrub subdominants such as flat-top buckwheat, Mohave Yucca, white burrobrush, cacti, Mexican bladder sage (*Salazaria mexicana*), big galleta, black and sideoats grama (*Bouteloua eriopoda* and *B. curtipendula*, respectively), bush muhly (*Muhlenbergia porteri*), and desert needlegrass (*Stipa speciosa*).

- Winter Fat Communities

Winter fat is a dense medium-sized shrub that is widely distributed in creosote bush-bur sage, blackbrush, saltbush, and wolfberry communities in the ES area. It occurs dominantly on the southern and western slopes of the Music Mountains, on the Crozier Canyon allotment.

- Riparian Desertscrub Communities

Riparian streamside desertscrub communities bisect all but the mountaintop communities. Species intergrade to varying extent along the riparian belt and the subdominant species reflect the nature of each adjacent community.

Catclaw acacia (*Acacia greggii*, a shrub to small tree) is most frequent as dense scrub bordering washes (often referred to as an acacia bosque). Understory subdominant shrubs include goldenweed (*Aplopappus* spp.), snakeweed, rayless goldenweed, and white burrobrush; desert grasses include big galleta, bush muhly, and dropseed (*Sporobolus* spp.). More open stands occur where creosote bush is subdominant.

Tamarisk (*Tamarix chinensis*) and arrowweed (*Pluchea sericea*) are the most common phreatophytes of the Colorado River and also occur within the lower drainage washes tributary to the Colorado.[16] Desert seep-willow (*Chilopsis linearis*) occurs as a prominant species along the Colorado, as well as in the western washes of the Cerbat Mountains.

The Sonoran Desertscrub Biome portion of the Desertscrub Formation is represented in the extreme southern section of the ES area, entirely within that portion reserved for wildlife, unalloted, and thus unsurveyed to date. The major communities are present in the ES area.

The Lower Colorado Valley subunit of the Sonoran Desert is noted for floristic simplicity, with 90-100% of the intermountain plains and bajadas dominated by creosote bush and bur sage, usually in total cover densities of less than 12%.[17] Shrubs and cacti such as white ratany (Krameria grayi), ocotillo (Fouquieria splendens), beavertail, buckhorn cholla, diamond cholla (Opuntia basilaris, O. acanthocarpa, O. ramosissima, respectively), and Engelmann hedgehog (Echinocereus engelmannii) comprise the remaining percentages of this creosote bush bur-sage communities.[18,19]

The Sonoran riparian desertscrub community has the notable replacement of the dominance of catclaw acacia by mesquite (Prosopis juliflora) along the margins of the washes. Paloverde (Cercidium floridum, C. microphyllum), wolfberry, and bush encelia (Encelia frutescens) occur also in the washes, intermixed with species from the interfluvial plains.

Ecology of The Desertscrub Formation

The desert follows a pattern of community succession known as auto-succession.[20,21,22] This process involves the recovery of climax communities, after either natural or man-caused disturbance, without succession of floristically discrete assemblages (seral stages) between pioneer and climax communities. At the lower and middle elevations, soils are scarcely modified by the soil-forming processes; hence the substrates are usually not fundamentally different after disturbance than before. In the absence of climatic change, the only species able to occupy the soils after disturbance are still the original species -- i.e., most native species are the pioneer species of the region. Plant succession, which occurs in orderly and predictable sequence in humid regions (where the concept was developed by Clements[23] and Tansley[24]), does not occur.[25]

Much of the vegetation in the desertscrub in the ES area is held in a disturbance regeneration equilibrium (disclimax)[26] best referred to as a "grazing climax."[27] This affects all communities subject to grazing pressure in proportion to that pressure, but tends to affect the various life-forms within the communities in different ways. Trees, shrubs, and perennial and annual forbs and grasses are the major life-forms present in the desertscrub.

Mature trees and shrubs are resilient to browsing to varying degrees once they establish a strong vegetative structure with sufficient roots. However, seedlings and young plants are usually more palatable than is the woody tissue of older plants.[28,29] The regeneration of perennial populations may be retarded by infant mortality so that the community may be maintained at less than its potential density and diversity. In the areas of natural low density, it is possible that some species may be eliminated by continual population retardation.[30]

Perennial forbs (herbaceous non-graminoid species) are more sensitive to foraging than grasses and are usually destroyed when aerial portions are removed. During the winter many desert plants are physiologically active (the amount of growth depending upon air temperature). The presence

of overwintering green leaves and associated meristems appears requisite to spring reproductive growth.[31] Reduction of this spring reproductive potential could eventually change community composition. Certain root-perennial species can survive to re-sprout from a woody caudex or root-base, and naturally die back in dry times. These forms seem more resistant to grazing and other disturbance factors and may actually increase in community importance with continued, but not severe, disturbance.

Ephemeral vegetation constitutes up to 50% of the total flora for certain southern and lower sections of the ES area.[32] Both winter and summer annual growth patterns occur in the northern half of the Sonoran Desert and throughout the Mohave Desert, producing two short bursts of germination and growth controlled by the sporadic but generally bimodal rainfall.

Late-September/early-October mass germination favors the common desert families: phlox, waterleaf, buckwheat, bean, evening primrose, and alfilaria, as well as creosote bush and white bur sage.[33] Grazing during this period would stress these species more than those germinating at a different time. There is also a critical period in early spring (late March to early April) when the rapid increase in the physiological activity of all plant components rapidly reduces available moisture in the winter annual root zone (upper 25 cm of soils).[34] Grazing during this period would greatly stress the winter annual populations.

(b) Grassland Formation. The Grassland Formation is represented in the ES area by two biomes, each containing several communities. The Plains Grassland occurs mainly in the easternmost extension of the ES area around Truxton. The Desert Grassland Biome is composed of grass-dominated transitional communities positioned between Desertscrub and Scrubland (where present) or Woodland formations.

- The Plains Grassland Biome

Big galleta is the most common perennial bunchgrass, occurring as a dominant community on shallow sandy to gravelly soils. Annual grass species, and sand dropseed (*Sporobolus cryptandrus*), bush muhly, and black grama occur as subdominants.

On deeper soils less subject to erosion, black grama and sideoats grama occur as community dominants with three-awn (*Aristida* spp.), bristle grass (*Setaria macrostachya*), and the other species noted in the galleta-tobosa community. Black grama, blue grama (*Bouteloua gracilis*), and *stipa neomexicana* occur as dominant associations under chaparral and pinyon-juniper in the Crozier allotment.

Where the grama and galleta grasslands are intermingled in more dissected topography, the particular dominance patterns are lost in a mosaic of mixed grass communities. An example may be found on the Hackberry allotment, where a mixture of big galleta, black grama, sideoats grama, bush muhly, and three-awn grasses occurs.

• The Desert Grassland Biome

The same grasses appear as dominants in the Desert Grassland, associated with shrubs and cacti. For example, big galleta occurs with banana Yucca (Yucca baccata), buckthorn cholla, bur sage, buckwheat, rayless goldenweed, snakeweed, and goldenweed on the upper floodplains and bajadas of the western slopes of the Music Mountains.

Alkali sacaton (Sporobolus airoides) is found mainly on heavier, poorly drained soils, noted especially east of Truxton Wash in the Cedar Canyon allotment, and in the Truxton Canyon and CQT allotments. Bear grass-shrub (Nolina microcarpa) communities are present in the Music Mountain and CQT allotments.

The shrub-grass scrub disclimax communities are particularly evident in heavily used portions of the Sacramento and Hualapai valleys, especially on the Cedar Canyon, Canyon Ranch, and Cane Springs allotments. This disturbance community is due to grazing pressure and competition between the grasses and the shrub and cacti.

Grasses are better adapted to grazing pressure than other life-forms. Growth originates at the basal meristem, close to the soil surface. Aerial portions are less necessary to the plants' survival and may be regenerated quickly (1) if the root-crown is not permanently damaged, and (2) if sufficient photosynthesis has taken place to provide for root development and annual replacement.[35] In fact, moderate grazing during the winter may stimulate plant growth the following spring, because removal of plant material containing carbohydrate reserves may increase photosynthetic activity to replace the lost material.[36,37] Enough plants must be allowed to bloom and seed to replenish the seedbed resources.

(c) Scrubland Formation. The Interior Chaparral Biome of the ES area is characterized by dense growth of perennial evergreen and semi-deciduous shrubs, forming a distinct transition belt (3500-5000 feet) between the grasslands below and the woodlands above. The two most common associations present in the evergreen sclerophyll communities of the Scrubland Formation are described.

The Quercus turbinella association contains the tough-leaved evergreen scrub oak, by far the most common dominant species of the chaparral. Flat-top buckwheat is subdominant to the scrub oak in the lower rocky areas of both the Cerbat and Music mountains, with scattered occurrence of silk tassel (Garrya flavescens), buckthorn (Rhamnus spp.), mountain mahogany (Cercocarpus spp.), and other shrubs more common in the Woodland Formation understory.

Desert buckbrush (Ceanothus greggii) forms the dominant in associations on the central western slopes of both the Cerbat and Music mountains. Subdominants of scrub oak (in the Musics), silk tassel, and manzanita (Arctostaphylos pringlei) (in the Cerbats) form true chaparral mountain shrub, with grassy understories of squirreltail (Sitanion hystrix) and those grass species noted below for the open chaparral. Buckbrush tends to become abundant on burned slopes of higher elevations.[38]

On the lower edge of the chaparral, in more open terrain and less dense stands, banana Yucca and various goldenweeds often subdominate, with a rich development of grass-forb understory including desert needlegrass, black and sideoats grama, three-awn, mutton grass (Poa fendleriana and Poa spp.), and the perennial forbs, beard tongue (Penstemon spp.) and Searle prairie clover (Petalostemon searlsiae).

(d) Woodland Formation. The Rocky Mountain Conifer Woodland Biome of the ES area is simple in dominance structure, containing pinyon-juniper communities composed of pinyon pine (Pinus monophylla), and one-seed and Utah juniper (Juniperus monosperma and J. osteosperma, respectively) in varying canopy mixtures. Juniper generally dominates at lower elevations (below 4500 feet), and is codominant with pinyon only in the Cerbat Mountains at middle elevations. Juniperus californica can withstand more xeric conditions than other junipers, and extends to lower elevations in the Black Mountains, where it occurs intermixed with species of the Desertscrub Formation.

Pinyon dominates the woodland at the upper elevations. The juniper is more prevalent throughout the area, as is the case for most of Arizona.[39]

In Juniperus associations, a sparse understory of cacti, a few grass species, and occasional sagebrush (Artemisia spp.) or other mountain shrubs may occur under juniper. More commonly in the ES area, scrub oak is codominant with juniper and a complex understory of shrubs and grasses (some of which may be locally dominant) occurs. Shrub associates include snakeweed, cliff rose (Cowania mexicana), rabbit brush (Chrysothamnus spp.), banana Yucca, catclaw acacia (in ravines and on rocky talus), Mohave thorn, and blackbrush (at lower elevations). Sideoats and black grama, Indian rice grass (Oryzopsis spp.), squirreltail, and sand dropseed are common grasses of the woodland. Notable perennial herbs include beard tongue, pain brush (Castilleja spp.), globe mallow (Sphaeralcea ambigua), weakstem mariposa (Calochortus flexuosus), and Colorado four-o'clock (Mirabilis multiflora).

As within the juniper associations, scrub oak is the most common subdominant in the Pinus monophylla associations of the ES area. Snakeweed species are second in subdominance, and all species associated with the juniper may be found likewise within the pinyon associations.

Two unique areas dominated by century plant (Agave spp.) occur on the western slopes of the Music Mountains, and provide an important addition to the woodland structure and flora.

(e) Forest Formation. The Montane Conifer Forest Biome is represented in only a small portion of the study area. Ponderosa pine (Pinus ponderosa associations) dominates the pine communities on the ridges and slopes surrounding Mt. Tipton in the Cerbat Mountains and is present in

the southern portion of the Music Mountains on the Crozier allotment. In the Cerbats, the forest extends north and south over perhaps five miles of high-elevation mountain crests and saddles. The western slope has ponderosa pine only near the crest; the eastern, cooler slope continues the pine forest down into the protected canyons at the western edge of the Cane Springs allotment.

Only three associations have been delineated by BLM survey for the ponderosa pine forest: ponderosa in pure stands, mixed with pinyon (as on the lower edges), and ponderosa with an understory of Engelmann's prickly pear. Much of the forest is considered rough and inaccessible to grazing, being located on the steep and rocky desert mountain terrain. The rugged topography does not lend itself to the typical pine forest understory, but rather to the more resilient species of the chaparral: buckbrush, cliff rose, and apache plume (Fallugia paradoxa), for example. Grasses, in addition to those noted for the woodland and chaparral, include blue grama, mountain brome, and June grass (Koeleria cristata) especially near the springs. Perennial forbs not found commonly in previous mentioned communities include meadow rue (Thalictrum fendleri) and vetch (Vicia americana).

(2) Phenology of Plants (ES Area). Table II- 8 shows the phenological development stages for key forage plants in the area. Based upon climatic conditions and the plants' responses to them, the year may be divided into three periods: spring growing season (March 1-June 30), summer growing season (July 1-October 30), and winter dormant season (November 1-February 30).

During the spring growing season, cool season grasses, sedges, herbs, shrubs, and some warm season grasses begin growth. Winter annuals undergo rapid vegetative and reproductive development as the air and soil temperatures shift to spring regimes. These species utilize winter and spring moisture. In the ES area the cool season species develop in environments where both temperature and moisture are the principal factors limiting growth depending upon elevation.

The occurrence of a critical heavy autumn rain of frontal origin (late September to early December after temperatures have changed to a cooler regime) is an important trigger to the vegetative growth and flowering of many perennial species in the spring and to the germination of the winter annuals. Soil moisture is brought to field capacity to variable depths and vegetative and reproductive growth of the plant components of the system are usually ensured through the subsequent spring season if one inch of rain is received. If the heaviest rain of the period is less than one inch but greater than a half inch, only scattered plants are physiologically active the following spring. If no individual autumn rain approaches one inch, essentially all perennial plants of the Mohave Desert are dormant during the following March through May or absent in the case of annuals.[40,41]

In the spring, the period from about March through May is the most critical. The first part of this period is important for growth and production and the latter part for seed maturation and dissemination.

TABLE II-8

PHENOLOGY OF KEY SPECIES
CERBAT/BLACK MOUNTAIN ES AREA

| Species | Season of Growth* | Growth Initiation | Flowering | Peak of Flowering | Seed Ripe | Seed Dissemination | Root Growth |
|---|---|---|---|---|---|---|---|
| **Grasses** | | | | | | | |
| Crested Wheatgrass *Agropyron cristatum* | Dual | 3/15 | 5/15<br>7/20 | 6/15<br>8/15 | 8/1<br>9/15 | 8/25<br>10/1 | –<br>– |
| Sideoats Grama *Bouteloua curtipendula* | Warm | 6/15 | 7/1 | 8/1 | 8/20 | 9/5 | 7/1 |
| Black Grama** *Bouteloua eriopoda* | Warm | 7/1<br>(7/15) | 7/25<br>(8/10) | 9/1<br>(9/15) | 9/20<br>(10/5) | 10/5<br>(10/15 | 7/1<br>(7/15) |
| Blue Grama** *Bouteloua gracilis* | Warm | 7/1<br>(7/15) | 8/1<br>(8/15-20) | 9/1<br>(9/15) | 9/15<br>(10/1) | 10/15<br>(11/1) | 7/1<br>(7/15) |
| Big Galleta *Hilaria rigida* | Warm | 3/25 | 9/1 | 9/20 | 10/15 | 11/10 | 3/25–<br>5/10 |
| June Grass *Koelaria cristata* | Cool | 3/25 | 4/20 | 5/20 | 6/30 | 7/30 | – |
| Bush Muhly *Muhlenbergia porteri* | Warm | 7/15 | 9/1 | 9/30 | 10/20 | 11/15 | – |
| Indian Rice Grass *Oryzopis hymenoides* | Warm Spring-Summer | 3/15 | 4/15 | 5/1 | 5/15 | 6/1 | – |
| Sand Dropseed *Sporobolus cryptandrus* | Warm | 6/20 | 8/1 | 8/20 | 10/15 | 11/1 | – |
| Desert Needlegrass *Stipa speciosa* | Cool | 3/15 | 4/15 | 5/1 | 5/30 | 6/20 | – |
| **Shrubs** | | | | | | | |
| Four-wing Saltbush *Atriplex canescens* | Warm Spring-Summer | 3/20 | 8/1 | 8/30 | 9/10 | 10/20 | – |
| Desert Ceanothus *Ceanothus greggii* | Dual | 7/1<br>3/1-15 | –<br>4/1 | –<br>4/15 | –<br>6/1 | –<br>6/15 | –<br>– |
| Birchleaf Mountain Mahogany *Cercocarpus betuloides* | Dual | 7/1<br>3/1 | 8/1<br>6/20 | 8/15<br>7/10 | 9/15<br>8/15 | 10/15<br>10/15 | –<br>– |
| Cliff Rose *Cowania mexicana* | Warm Spring-Summer | 3/15 | 7/25 | 8/25 | 10/1 | 11/20 | – |
| Silk Tassel *Garrya wrightii* | Warm | 8/1 | 8/15 | 9/1 | 10/1 | 10/15 | – |
| Turbinella Oak *Quercus turbinella* | Warm | 5/10 | 5/15 | 6/15 | 7/20 | 9/1 | – |
| Hollyleaf Bucktorn *Rhamnus crocea* | Warm Spring-Summer | 5/15 | 6/20 | 7/10 | 8/15 | 9/15 | – |
| Skunkbush *Rhus trilobata* | Cool | 3/15 | 4/15 | 5/1 | 6/1 | 6/20 | – |

*Season of growth: Dual season – Able to grow when moisture is available. Spring or summer.
Warm season – Initiates growth in summer.
Cool season – Initiates growth in spring and/or fall.

**Able to reproduce by rhizomes (*B. gracilis*) and stolons (*B. eriopoda*).

Sources: Bello Sule, Rasmo Garcia, Fred C. Pinkney, Jerry G. Schickedanz, and Floyd W. Pond, University of Arizona; Arthur D. Little, Inc., communication with specialists of the Soil Conservation Service, BLM, and U.S. Forest Service.

During the summer growing season, warm season species make their best growth. Warm season species, in response to temperature and moisture, grow at a moderate rate during April and then decrease to a low rate during May and June. If there is no precipitation, they may go into a period of semi-dormancy.

From mid-July through August, warm season species begin to develop flower stems and their height increases rapidly. In dry years few flower stalks develop and plant growth generally corresponds to the timing of seasonal precipitation. Rains occurring later than usual may delay growth, but earlier rains do not result in appreciable growth of warm season species. For a number of species there may be prolonged or out-of-season growth on disturbed soils, particularly in relation to summer rains.[42]

During the winter many desert plants are physiologically active (the amount of growth depending upon air temperature). The presence of overwintering green leaves and perhaps associated meristems appears requisite to spring reproductive growth.[43] As noted previously, cooler temperatures and the sporadic but common occurrence of snow for short intervals are normal and necessary for the survival of the indicator species of the Joshua tree and blackbrush communities.[44,45]

b. Vegetative Condition of the Range

The vegetative or range condition classification is an expression of the vegetative community composition (by species), the quantity and quality of forage produced, vegetative ground cover (density), plant vigor, ground litter and current soil erosion, and seed production and seedling establishment. The condition classifications are expressed in three categories -- good, fair, and poor -- as follows:

- Good Condition - Composition is 40% or more of both desirable and intermediate species with at least 20% made up of desirable species. Erosion condition class is slight to stable (soil surface factor is less than 40).

- Fair Condition - Composition is 15-39% of desirable and intermediate species with 5% or more made up of desirable species. Erosion condition class is less than critical (soil surface factor is less than 60). Also, ecosystems where 60% or more of the intermediate species and less than 5% desirable species are present will be rated fair condition when erosion condition class is moderate to stable.

- Poor Condition - Composition is less than 15% desirable and intermediate species. Erosion condition class is critical to severe (soil surface factor is more than 60). (It should be noted that if the erosion condition class is severe to critical, the site is rated in poor condition regardless of the plant composition.)

Of the many criteria that combine to make up vegetative (range) condition, the reaction of species composition to grazing pressure is the main one. A change in species composition (whether by decreasers, increasers, or invaders) is a reflection of plant succession.

It should be noted that management goals may or may not favor a climax condition. In some instances in certain vegetative types, a goal of subclimax may yield maximum production and reduce the soil erosion hazard.

In range condition classification, the plant species are categorized as desirable, intermediate, and least desirable. The criteria for determining these categories are:

- Desirable - Those plants which are palatable, productive, and nutritious forage species. They are often dominant under climax or near climax conditions, and are long-lived having extensive root systems that aid in watershed erosion protection.

- Intermediate - Those plants of secondary importance in the climax which often are indicators of ecological change. They replace the desirables as condition deteriorates and replace the least desirables as condition improves. They may be less palatable to grazing animals or be more resistant to grazing use.

- Least Desirable - Those plants that are definitely the poorer species in a plant community, consisting primarily of invaders, noxious, and low-value forage species. (Note that vegetative [range] condition classification systems use a perennial plant base as the primary criterion for condition classification. Hence, annuals in other than ephemerally-designated range areas fall into this category.)

In relation to present range conditions, it is significant to recognize that prior to 1973, base property qualifications had not been established within the ES area for perennial or perennial/ephemeral ranges. Hence, as a result of a resolution of the Phoenix District Advisory Board, dated January 22, 1973, the district manager was authorized to establish livestock numbers as base qualifications based upon an average of the last 10 years' historical use. The number to be arrived at would represent a true average (discounting years of exceptional moisture and years of drought). Opportunity for discussion of disagreements over the arrived-at number was provided and there was also opportunity for the permittee to protest to the District Advisory Board and/or appeal to an administrative law judge.

There was also the opportunity for the district manager to consider supplemental temporary non-renewable licenses for additional numbers during periods when excessive forage was available.

Historical livestock use patterns combined with other factors have created slow and subtle over time but dramatic overall changes in some plant communities within Mohave County, including the ES area, since the introduction of domestic livestock. Such half-shrubs as snakeweed (Gutierrezia sarothrae), rabbit brush (Chrysothamnus nauseosus and C. viscidiflorus), turpentine bush (Aplopappus laricifolius), and goldenweed (Aplopappus lineariflorus) were once undoubtedly minor species in grassland areas, but now in many places, they are dominating plants due to excessive grazing.[46] The 1937 Natural Vegetation Map of Arizona[47] shows a short grass (plains) aspect for many areas within the ES area that are now noted as desertscrub and shrub-grass scrub disclimax designation of much of the Hualapai Valley as classified by Brown and Lowe.[48]

Radical changes in plant communities are dependent upon either developmental changes in endemic or nearby exotic vegetation, introduction of new species, or marked changes in the environment, as follows:

- Changes of a developmental nature are evolutionary, requiring thousands of years. Hence, this option as a reason for the recent change can be ruled out.
- The introduction of new species into the area has had no impact on a change in the natural vegetation as the encroaching woody species (shrubs and half-shrubs) are without exception natives.
- Hence, by the process of elimination, it remains that one or more factors of the environment have changed sufficiently to have affected the vegetation to a marked degree.

These influencing factors that have been modified are change of climate, livestock grazing, plant competition, rodent and rabbit influence, and fire. Of these factors, the combination that appears to have had the most significant impact in the gradual deterioration of the range is that of livestock grazing and fire control. Climatic changes over the past 100 years have been relatively minor, though since 1930 the annual cumulative rainfall at the Kingman station has been declining. (See Figure II- 3 .) Competition between plants and influences of rodents and rabbits appear to have had minimal impact on vegetative changes within the ES area.

Excessive and improperly managed livestock grazing has contributed to the vegetative decline within the ES area. Removal of excess herbage (plant material), which otherwise could have periodically served as fuel in natural wild fires, has resulted in a decline of such fires. In the past, these fires burned large areas, killing established woody species seedlings and limiting the advance of woody species to the fringes of the more typic grassland types.[49]

Such vegetative changes since the introduction of domestic livestock into the area have resulted in a general deterioration of the range to its present fair to poor condition. And under present management, the apparent trend in range condition of many of the allotments continues to decline (Table II-9 ).

Trend data can be related to only in terms of apparent trend as there are no historical benchmarks or reference points to use for comparison in order to derive the long-term picture. Comparative association with adjacent sites with a known history of little or no livestock use can indicate apparent trend, as can comparison with the existent exclosures that are scattered through the ES area.

Three of the 26 allotments within the ES area are classified solely as ephemeral, and as such are not subject to range condition classification as are the remaining 23 allotments which are perennial or ephemeral/perennial.

Vegetative (range) condition in the ES area is described in Figure II-14.

During 1976-77, 19 allotments were intensively surveyed using the ocular reconnaissance method, as discussed in Chapter I. Portions of two allotments with ephemeral range were not surveyed (Big Ranch and Diamond Bar/Gold Basin). The Crozier Canyon allotment was intensively surveyed in 1958 using the same method. Extensive surveys using pace-point transects within very broad vegetation types were conducted in 1976-77 on the Black Mountain, Ft. McEwen, and Hackberry allotments. The ephemeral portion of Ft. McEwen was not surveyed, nor were the three ephemeral allotments -- Portland Spring, Silver Creek, and Thumb Butte.

In addition to the range survey information as compiled by the BLM (as noted above), range specialists and technicians conducted intensive surveys of representative vegetation subtypes on 19 allotments within the ES area (Figures II-15 and II-16*). A variation of a metric belt transect method developed by Schmutz[50] was used to measure crown cover density and species composition. It was also used to gather forage production data by species on the same allotments (Table II-10). Current forage production data were gathered utilizing the Square Foot Belt Transect-Vegetation Data Collection Method (see Appendix E). Forage production transects were run at different times of the growing season -- some before the 1977 summer rains, others after. Though forage production has been adjusted relative to percent utilization and/or percent moisture content,[51] extreme variances as much as 100-300% can occur in forage production on Arizona rangelands from year to year. Hence, numerous years of data are necessary before valid grazing capacities using forage production as a base can be determined. Table II-11 indicates potential production (cyls) related to soil associations, estimated current grazing capacity, and initial stocking under the proposed action. In some specialized instances where an appreciable amount of forage is provided by seasonal annuals, such as the floodplains on the Cedar Canyon and Cane Springs allotments, this large quantity of forage is not reflected in the clipping transects.

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*Figures II-16 will be found in the "pocket" at the end of this volume.

TABLE II-9

VEGETATIVE (RANGE) CONDITION BY ALLOTMENT, ES AREA

| Allotment Name and Number | | Vegetative (Range) Condition Classification by Acres: Poor | Fair | Good | Miscellaneous | Total Acres | Apparent Trend[a] |
|---|---|---|---|---|---|---|---|
| Big Ranch | 7A | 19,224 | 126,368 | 20,627 | 1,250 | 167,469[b] | Not apparent |
| Black Mountain | 10A | 69,121 | 48,713 | – | – | 117,834[c] | Not apparent |
| Cane Springs | 15A | 27,281 | 61,668 | 1,242 | 16,275[d] | 106,466 | Down |
| Canyon Ranch | 17A | 11,373 | 39,529 | 6,898 | – | 57,800 | Not apparent |
| Castle Rock | 18A | 1,336 | 9,193 | – | 334 | 10,863 | Down |
| Cedar Canyon | 19A | 5,838 | 61,274 | 20,740 | 391 | 88,243 | Stable to up |
| Clay Springs | 23A | 820 | 10,256 | 1,322 | 487 | 12,885 | Stable to up |
| Cerbat/Quail Springs/Turkey Track | 20A | 5,533 | 57,524 | 6,131 | 377 | 69,565 | Down |
| Crozier Canyon | 26A | No Current Range Condition Information[e] | | | | | Not apparent |
| Curtain | 27A | – | 3,670 | – | – | 3,670 | Stable to down |
| Diamond Bar/Gold Basin | 29A | 57,051 | 134,596 | 5,664 | – | 197,311[f] | Not apparent |
| Dolan Springs | 30A | 6,394 | 59,917 | 6,730 | – | 73,041 | Not apparent |
| Ft. McEwen | 34A | 6,585 | 52,541 | 2,036 | 44,686 | 105,848[g] | Down |
| Gediondia | 36A | 4,522 | 13,510 | 2,156 | 691 | 20,879 | Not apparent |
| Hackberry | 42A | 10,002 | 46,303 | 13,291 | – | 69,596 | Stable |
| Mineral Park | 55A | – | 15,641 | 941 | 1,449 | 18,031 | Down |
| Mt. Tipton | 58A | 9,025 | 5,064 | – | 197 | 14,286 | Not apparent |
| Mud Springs | 56A | 3,684 | 39,636 | 10,230 | 120 | 53,670 | Not apparent |
| Music Mountain | 57A | 1,688 | 13,640 | 4,877 | – | 20,205 | Down |
| Pine Springs | 60A | – | 4,547 | 3,428 | – | 7,975 | Up |
| Portland Spring | 61A | Ephemeral | | | | | |
| Silver Creek | 65A | Ephemeral | | | | | |
| Stockton Hill | 66A | – | 2,203 | 1,729 | – | 3,932 | Stable |
| Thumb Butte | 68A | Ephemeral | | | | | |
| Truxton Canyon | 70A | 161 | 5,699 | 6,736 | 70 | 12,666 | Not apparent |
| Upper Music | 71A | 6,145 | 22,746 | – | – | 28,891[h] | Down |
| | | 245,783 | 834,238 | 114,778 | 66,327 | 1,261,126[i] | |

a. Trend of range condition is based upon professional judgmental factors and comparisons with exclosures and/or adjacent areas. Because there have been no long-term studies, trend is only apparent.
b. Acreage under grazing systems – excluding ephemeral range.
c. Includes custodial acreage.
d. Includes acreage in Red Lake and other waste acreage.
e. Intensive survey (1958 ocular reconnaissance method) – no current data.
f. Excludes ephemeral acreage.
g. Includes custodial and ephemeral (here listed under miscellaneous).
h. Includes only desert portion of allotment.
i. Total acreages under management exclusive of 447,929 acres, Big Ranch; 114,616 acres, Crozier Canyon; 49,710 acres, Diamond Bar/Gold Basin; 41,555 acres, Portland Spring; 92,507 acres, Silver Creek; 36,355 acres, Thumb Butte; and 17,863 acres in the mountain portion of Upper Music. Grand total of all acreage under AMPs is 2,061,661.

**Source:** 1976-77 BLM Resource Inventory.

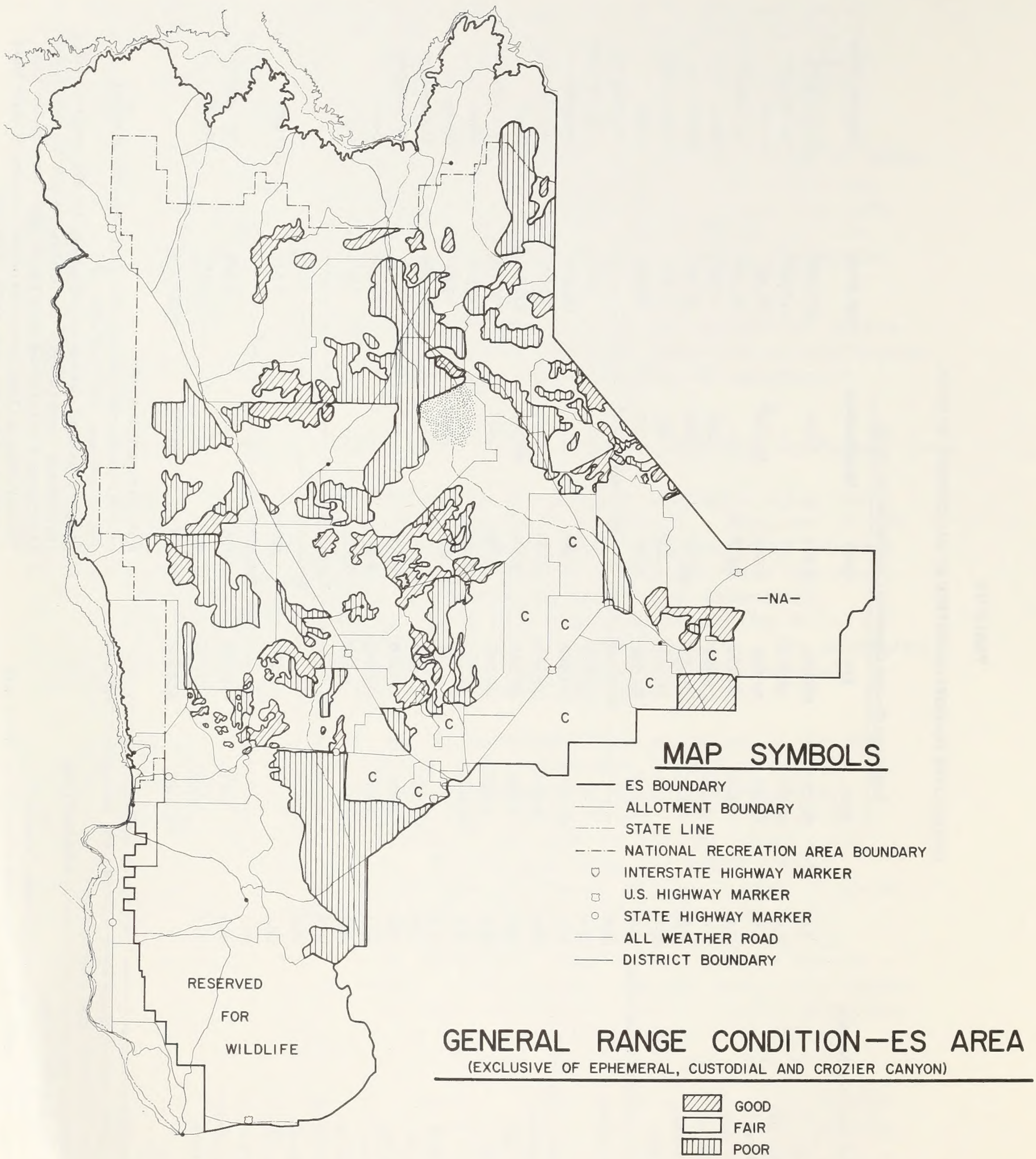


**FIGURE II-14 GENERAL RANGE CONDITION – ES STUDY AREA**

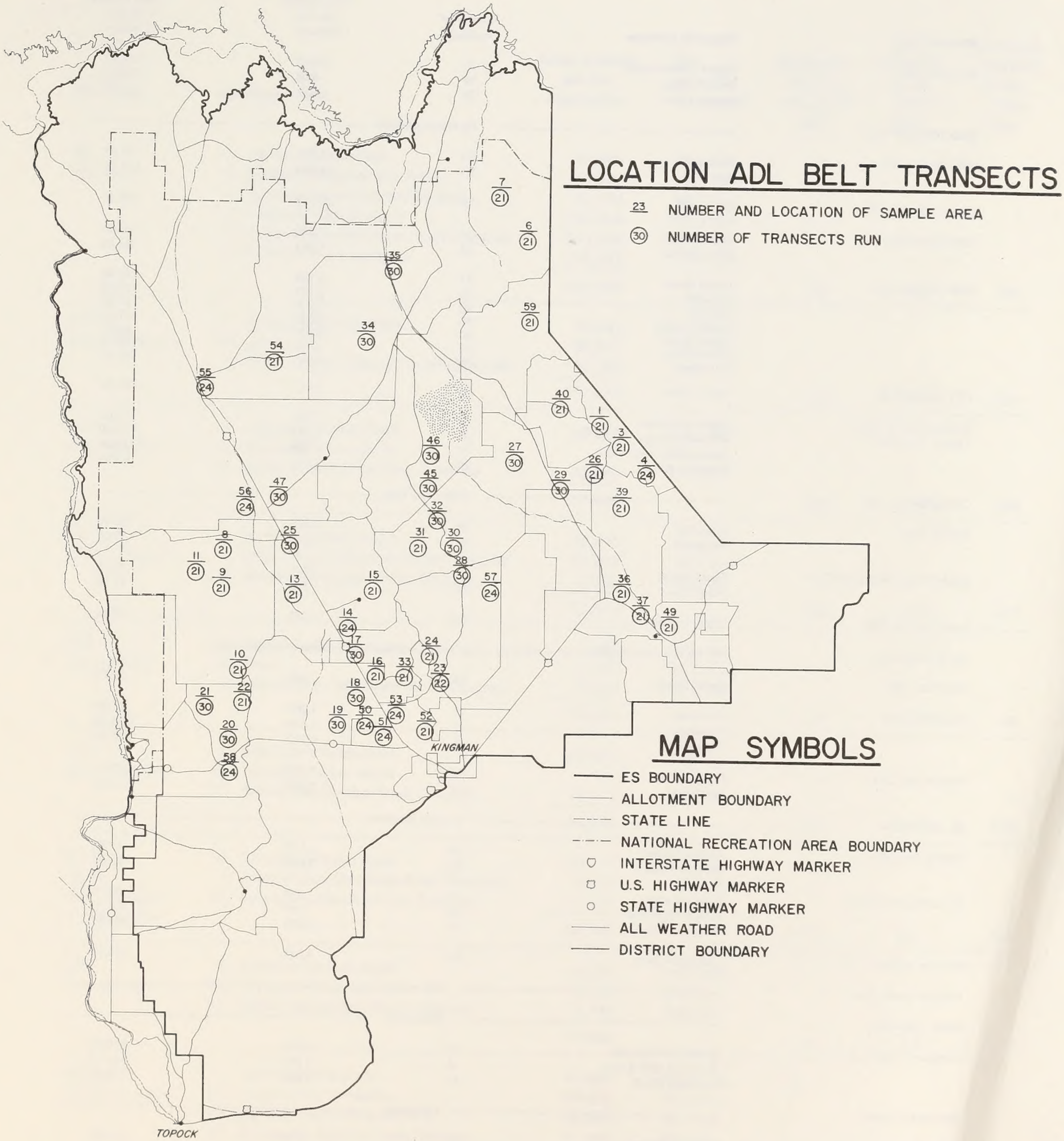


FIGURE II-15 LOCATION OF BELT TRANSECTS

**TABLE II-10**

**HERBAGE PRODUCTION SAMPLE VEGETATION SUBTYPES**
**(grams converted to pounds per acre)**

| Allotment | Vegetative Subtypes | Number of Transects | Total Grams Air Dry Herbage | Total Pounds Air Dry Herbage |
|---|---|---|---|---|
| Big Ranch 7A | Desert Shrub-Hilaria | 21 | 2,132 | 101.52 |
| | Creosote Bush | 24 | 480 | 20.00 |
| | Creosote Bush | 23 | 607 | 26.93 |
| Black Mountain 10A | No Data Collected | | | |
| Cane Springs 15A | Grassland | 30 | 2,753 | 91.77 |
| | Half-shrub | 30 | 4,294 | 143.14 |
| Canyon Ranch 17A | Grassland | 24 | 2,423 | 100.96 |
| Castle Rock 18A | Desert Shrub | 21 | 1,680 | 80.00 |
| | Desert Shrub | 24 | 1,547 | 64.46 |
| Cedar Canyon 19A | Desert Shrub | 21 | 2,286 | 108.86 |
| | Saltbush | 30 | 2,485 | 82.83 |
| | Saltbush | 30 | 2,040 | 68.00 |
| | Creosote Bush | 30 | 3,037 | 101.23 |
| | Desert Shrub | 30 | 2,657 | 88.57 |
| | Desert Shrub | 21 | 1,850 | 88.10 |
| | Grassland | 30 | 2,841 | 94.70 |
| Clay Springs 23A | Desert Shrub | 21 | 3,414 | 162.57 |
| Cerbat/Quail Springs/ Turkey Track 20A | Grassland-Shrub | 21 | 1,000 | 47.62 |
| | Grassland-Cactus | 24 | 4,884 | 203.50 |
| | Juniper-Grassland | 21 | 2,584 | 123.05 |
| | Grassland-Shrub | 30 | 2,822 | 94.07 |
| Crozier Canyon 26A | Inadequate Data | | | |
| Curtain 27A | Grassland | 24 | 2,455 | 102.28 |
| | Grassland | 24 | 3,240 | 135.00 |
| Diamond Bar/Gold Basin 29A | Desert Shrub | 30 | 1,095 | 36.50 |
| | Desert Shrub | 30 | 831 | 27.70 |
| Dolan Springs 30A | Creosote Bush | 30 | 1,263 | 42.10 |
| Ft. McEwen 34A | (At the time transects were run — late July — there was inadequate plant material for clipping.) | | | |
| Gediondie 36A | Desert Shrub | 24 | 592 | 24.67 |
| Hackberry 42A | Grassland | 21 | 1,287 | 61.29 |
| | Grassland | 21 | 7,543 | 359.19 |
| | Grassland | 21 | 5,742 | 273.43 |
| Mineral Park 55A | Desert Shrub | 30 | 1,319 | 43.97 |
| | Half-shrub | 21 | 3,025 | 144.05 |
| Mt. Tipton 58A | No Data Collected | | | |
| Mud Springs 56A | Creosote Bush | 30 | 1,136 | 37.87 |
| | Creosote Bush | 30 | 2,575 | 85.83 |
| Music Mountain 57A | Pinyon-Juniper | 21 | 1,386 | 66.00 |
| | Juniper-Sagebrush | 24 | 247 | 10.29 |
| | Mountain Shrub | 21 | 7,592 | 361.52 |
| Pine Springs 60A | Half-shrub-Grass | 21 | 4,212 | 200.57 |
| Portland Spring 61A | Ephemeral | | | |
| Silver Creek 65A | Ephemeral | | | |
| Stockton Hill 66A | Grassland (Non-use) | 11 | 8,911 | 810.09 |
| | Grassland (Use Area) | 10 | 1,617 | 161.70 |
| | Mountain Shrub | 21 | 2,600 | 123.81 |
| Thumb Butte 68A | Ephemeral | | | |
| Truxton Canyon 70A | Desert Grassland | 21 | 4,724 | 224.95 |
| Upper Music 71A (Mountain Portion) | (Revegetation) Pinyon-Juniper | 21 | 5,496 | 261.71 |

**Notes:**
- Total sample transects run = 983. Each herbage production transect was 96 feet in length and 1 foot wide. This equates to a total sample of 94,368 square feet.
- This forage production information is not intended as a conversion factor to arrive at grazing capacity per sampled allotment. However, this adjusted forage production can be used as an indicator of forage production for various vegetation areas within the ES area as of the fall of 1977.

**Source:** American Ag International Vegetative Survey, 1977.

**TABLE II-11**

**ESTIMATED POTENTIAL RELATED TO SOIL ASSOCIATIONS BY ALLOTMENT**

| Allotment | Soil Association | Total Acreage per Soil Association | Soil Potential for Range[a] | Estimated Grazing Capacity[b] (cyl) | Initial Stocking Under AMPs[c] (cyl) | Estimated Potential Under AMPs (cyl) |
|---|---|---|---|---|---|---|
| 7A Big Ranch | 1. Antho-Vint-Gillman | 18,461 | Very low | | | |
| | 2. Laveen-Rillito-Carrizo-Antho | 30,769 | Very low | | | |
| | 3. Lomitas-Rock Outcrop-Gachado | 43,076 | Very low | | | |
| | 4. Anthony-Vinton-Agua | 104,616 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 203,095 | Very low | | | |
| | 9. Nickel-Rillino-Anthony | 215,382 | Very low | | | |
| | | 615,398 | | 472 | 425 | 461 |
| 10A Black Mountain | 4. Anthony-Vinton-Agua | 23,567 | Very low | | | |
| | 6. Cave | 58,917 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 35,350 | Very low | | | |
| | | 117,834 | | 126 | 314[d] | 361 |
| 15A Cane Springs | 4. Anthony-Vinton-Agua | 68,068 | Very low | | | |
| | 10. Tortugas-Purner-Jacks | 140 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 38,258 | Medium | | | |
| | | 106,466 | | 242 | 354[d] | 389 |
| 17A Canyon Ranch | 4. Anthony-Vinton-Agua | 26,010 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 28,900 | Very low | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 2,890 | Medium | | | |
| | | 57,800 | | 252 | 357[d] | 471 |
| 18A Castle Rock | 4. Anthony-Vinton-Agua | 108 | Very low | | | |
| | 6. Cave | 2,282 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 8,473 | Very low | | | |
| | | 10,863 | | 22 | 30[d] | 42 |
| 19A Cedar Canyon | 4. Anthony-Vinton-Agua | 68,830 | Very low | | | |
| | 10. Tortugas-Purner-Jacks | 141 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 19,413 | Medium | | | |
| | | 88,243 | | 194 | 528[d] | 546 |
| 20A Cerbat/ Quail Springs/ Turkey Track | 4. Anthony-Vinton-Agua | 29,217 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 9,044 | Very low | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 31,304 | Medium | | | |
| | | 69,565 | | 410 | 369 | 445 |
| 23A Clay Springs | 4. Anthony-Vinton-Agua | 6,314 | Very low | | | |
| | 10. Tortugas-Purner-Jacks | 2,835 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 3,736 | Medium | | | |
| | | 12,885 | | 21 | 19 | 65[e] |
| 26A Crozier Canyon | 5. Latene-Rillino-Cave | 43,554 | Very low | | | |
| | 10. Tortugas-Purner-Jacks | 29,800 | Medium | | | |
| | 11. Cabezon-Rudd-Thunderbird | 29,800 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 11,462 | Medium | | | |
| | | 114,616 | | 1,422 | 1,280 | 1,280 |

TABLE II-11 (Continued)

| Allotment | Soil Association | Total Acreage per Soil Association | Soil Potential for Range[a] | Estimated Grazing Capacity[b] (cyl) | Initial Stocking Under AMPs[c] (cyl) | Estimated Potential Under AMPs (cyl) |
|---|---|---|---|---|---|---|
| 27A Curtain | 4. Anthony-Vinton-Agua | 1,211 | Very low | | | |
| | 6. Cave | 2,459 | Very low | | | |
| | | 3,670 | | 18 | 16 | 25 |
| 29A Diamond Bar/ Gold Basin | 4. Anthony-Vinton-Agua | 93,868 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 46,935 | Very low | | | |
| | 8. Lithic Torriorthents-Rock Outcrop | 2,470 | Very low | | | |
| | 9. Nickel-Rillino-Anthony | 9,880 | Very low | | | |
| | 10. Tortugas-Purner-Jacks | 81,517 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 12,351 | Medium | | | |
| | | 247,021 | | 868 | 782 | 1,033 |
| 30A Dolan Springs | 4. Anthony-Vinton-Agua | 46,016 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 19,721 | Very low | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 7,304 | Medium | | | |
| | | 73,041 | | 167 | 150 | 194 |
| 34A Ft. McEwen | 1. Antho-Vint-Gilman | 19,053 | Very low | | | |
| | 4. Anthony-Vinton-Agua | 27,520 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 59,275 | Very low | | | |
| | | 105,848 | | 156 | 210[d] | 266 |
| 36A Gediondia | 1. Antho-Vint-Gilman | 1,462 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 19,417 | Very low | | | |
| | | 20,879 | | 56 | 50 | 80 |
| 42A Hackberry | 4. Anthony-Vinton-Agua | 44,541 | Very low | | | |
| | 5. Latene-Rillino-Cave | 3,480 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 6,960 | Very low | | | |
| | 10. Tortugas-Purner-Jacks | 696 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 13,919 | Medium | | | |
| | | 69,596 | | 496 | 446 | 446 |
| 55A Mineral Park | 4. Anthony-Vinton-Agua | 8,655 | Very low | | | |
| | 6. Cave | 361 | Very low | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 9,015 | Medium | | | |
| | | 18,031 | | 92 | 83 | 130 |
| 56A Mud Springs | 4. Anthony-Vinton-Agua | 28,445 | Very low | | | |
| | 6. Cave | 8,587 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 16,638 | Very low | | | |
| | | 53,670 | | 162 | 146 | 178 |
| 57A Music Mountains | 10. Tortugas-Purner-Jacks | 18,993 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 1,212 | Medium | | | |
| | | 20,205 | | 106 | 95 | 160 |
| 58A Mt. Tipton | 4. Anthony-Vinton-Agua | 4,857 | Very low | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 9,429 | Medium | | | |
| | | 14,286 | | 66 | 59 | 90 |

TABLE II-11 (Continued)

| Allotment | Soil Association | Total Acreage per Soil Association | Soil Potential for Range[a] | Estimated Grazing Capacity[b] (cyl) | Initial Stocking Under AMPs[c] (cyl) | Estimated Potential Under AMPs (cyl) |
|---|---|---|---|---|---|---|
| 60A Pine Springs | 4. Anthony-Vinton-Agua | 2,632 | Very low | | | |
| | 6. Cave | 3,350 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 159 | Very low | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 1,834 | Medium | | | |
| | | 7,975 | | 50 | 45 | 60 |
| 61A Portland Spring | 1. Antho-Vint-Gilman | 38,646 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 2,909 | Very low | | | |
| | | 41,555 | | Ephemeral | | |
| 65A Silver Creek | 2. Laveen-Rillito-Carrizo-Antho | 48,104 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 44,403 | Very low | | | |
| | | 92,507 | | Ephemeral | | |
| 66A Stockton Hill | 12. Barkerville-Gaddes-Rock Outcrop | 3,932 | Medium | | | |
| | | 3,932 | | 34 | 31 | 40 |
| 68A Thumb Butte | 1. Antho-Vint-Gilman | 6,907 | Very low | | | |
| | 2. Laveen-Rillito-Carrizo-Antho | 5,090 | Very low | | | |
| | 3. Lomitas-Rock Outcrop-Cachado | 8,725 | Very low | | | |
| | 7. Cellar-House Mountain-Rock Outcrop | 15,633 | Very low | | | |
| | | 36,355 | | Ephemeral | | |
| 70A Truxton Canyon | 4. Anthony-Vinton-Agua | 1,733 | Very low | | | |
| | 11. Cabezon-Rudd-Thunderbird | 2,280 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 8,613 | Medium | | | |
| | | 12,666 | | 50 | 45 | 62 |
| 71A Upper Music | 4. Anthony-Vinton-Agua | 3,273 | Very low | | | |
| | 10. Tortugas-Purner-Jacks | 26,649 | Medium | | | |
| | 12. Barkerville-Gaddes-Rock Outcrop | 16,832 | Medium | | | |
| | | 46,752 | | 207 | 186 | 230 |
| Totals | | 2,061,661 | | 5,689 | 6,020 | 7,054 |

a. From Selected Soil Interpretations; Soil Features and Interpretations Cerbat/Black Mountain Resource Area (Table II-3).
b. Based on AMP decision that initial stocking is at 90% of estimated grazing capacity for all allotments (Table I-3).
c. Includes 90% of current estimated grazing capacity plus initial stocking custodial on those allotments having custodial portions (Table I-3).
d. Includes initial stocking custodial use areas.
e. Actual estimated grazing capacity is 65 cyl (1976 Range Survey). Allottee chooses not to stock to full capacity.

**Sources:** Table II-5; Bureau of Land Management data; American Ag International Vegetative Survey, 1977

There is very limited data relative to forage production potential available within the ES area. However, there is a good indication of potential forage production on selected sites as a result of forage production data collected in 1977 on the Stockton Hill allotment (Table II-10). Within the grassland designation, predominantly desert needlegrass, twenty-one 96-foot by one-foot belt transects were run through two sites separated by a fence. One side of the fence had not been grazed for many years, the other side was grazed annually. Eleven transects run on the non-use side yielded a total of 810 lbs of air dry forage per acre. Ten transects on the use side of the fence yielded a total of 162 lbs of air dry forage per acre. The unused area was producing 500% more forage than the annually used pasture. This is single-year data and only reflects the year 1977; however, it indicates potential forage production for that particular site. This specific site lies within the Barkerville-Gaddes-Rock Outcrop Association which is one of three soil associations within the ES area that has a medium potential for range use.

An additional 1977 comparison of forage production potential can be cited as a result of data collected inside and outside of an exclosure in an old burn area on the Music Mountain allotment. At this site, three 96-foot by one-foot belt transects were run inside the exclosure (non-use), and three were run outside the exclosure (use area). Average herbage production for the transects inside the exlosure was 163 lbs per acre, while 60 lbs per acre were collected through sampling on the use side. The potential difference in forage production at this site for 1977 was 271%.

Only after additional forage production information is accumulated over time and tied to specific sites will a reasonable forecast of forage production potential be developed.

Average percent species composition and average percent crown cover are given for the principal vegetation subtypes within the ES area in Table II-12. This base information is helpful in establishing long-term trend data. The range condition data as compiled from the BLM 1976-77 resource inventories (Table II-13), and the data in Table II-10 establish base conditions from which various grazing management systems can be compared.

- Arthur D. Little, Inc., specialists were unable to collect herbage production information on two separate visits to portions of the Ft. McEwen allotment. In both instances (July and early September), there was only a trace of plant material available for harvest. Many of the sites looked at would appear to be in poor condition. The range condition information expressed in Table II-9 supports these observations with an apparent downward trend designation. Long-term rest phases as provided for in the Santa Rita system should have positive impacts on the condition of this allotment. Lack of rainfall in 1977 has had its obvious effects upon current forage production on this allotment.

TABLE II-12

**AVERAGE PERCENT SPECIES COMPOSITION AND AVERAGE PERCENT CROWN COVER OF PRINCIPAL VEGETATION SUBTYPES, ES AREA**

| | Average Percent Species Composition | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Desert Shrub | | | | | | | Creosote Bush | Half-shrub | Salt Bush | Pinyon-Juniper | Mountain Shrub | Grass | | |
| | Wolf-berry | Black-brush | Buck-wheats | Burro-brush | Brittle-brush | *Hilaria-Ambrosia* | Joshua tree | | *Guiter-rezia* | *Atriplex* spp. | | | *Hilaria rigida* | *Stipa speciosa* | Ungrazed for 15 Yrs |
| Average Percent Crown Cover* | 6.4% | 18.8% | 12.7% | 8.4% | 6.3% | 14.5% | 13.4% | 10.2% | 7.6% | 1.8% | 27.2% | 28.7% | 1.3% | 19.5% | 6.9% |
| Grasses | | | | | | | | | | | | | | | |
| *Aristida* spp. | | | 2.79 | | | | | | | | 1.06 | | | | |
| *Bouteloua gracilis* | | | | | | | | | | | 3.62 | | | | |
| *Bouteloua curtipendula* | | | | | | | | | | | 3.19 | | | 1.04 | |
| *Muhlenbergia porteri* | | | 1.76 | 2.03 | | | 1.6 | | 1.35 | | | | | | 12.9 |
| *Hilaria rigida* | | | 4.57 | 10.58 | | 25.38 | 7.5 | 4.56 | 6.0 | 18.34 | | | 43.48 | | 10.2 |
| *Bouteloua eriopoda* | | | 3.34 | 3.45 | | | | | 1.18 | | | | | 1.23 | 27.86 |
| *Erionenuron pulchellus* | 1.25 | | | | | 7.91 | | 2.1 | | 1.81 | | | | | 3.27 |
| *Sporobolus cryptandrus* | | | | | | | | | | 5.67 | | | | | 1.85 |
| *Scleropogon brevifolias* | | | | | | | | | | 1.14 | | | | 15.18 | |
| *Stipa speciosa* | | | | | | | | | | | | | | .726 | .31 |
| Others (insignificant) | .81 | .631 | 2.171 | 2.393 | .671 | 1.68 | 1.14 | 1.405 | .75 | .23 | 2.056 | 2.29 | | | |
| Forbs | | | | | | | | | | | | | | | |
| *Sphaeralcea* spp. | 4.22 | | | | 4.6 | | | 1.0 | | 8.51 | | | 2.31 | | |
| *Baileya multiradiata* | | | | | | | | | | | | | 9.23 | | |
| Others (insignificant) | 4.06 | .270 | 1.53 | .81 | .41 | .48 | .196 | .95 | .48 | .25 | .370 | .47 | | 1.32 | .41 |
| Shrubs | | | | | | | | | | | | | | | |
| *Lycium* spp. | 39.19 | 1.12 | | | | 1.24 | 5.65 | 4.5 | 2.81 | 24.7 | | | | | |
| *Ephedra* spp. | 9.53 | 2.98 | 5.06 | | 6.35 | 2.40 | 18.9 | 2.6 | 3.96 | | 1.18 | | | | 1.75 |
| *Coleogyne ramosissima* | | 72.9 | | 3.03 | | | | 4.4 | | | 3.14 | | | | |
| *Yucca baccata* | 13.12 | 3.05 | 1.30 | 3.63 | | 4.74 | 4.35 | | 3.36 | | 5.92 | | | | 2.16 |
| *Encelia frutescens* | 2.66 | 1.14 | 8.41 | | 3.90 | | 1.0 | | 4.40 | | | | | | |
| *Eriogonum fasiculatum* | 2.03 | 1.67 | 21.3 | 6.84 | 4.22 | 2.82 | | 3.49 | 5.26 | | 4.41 | | | 35.79 | |
| *Juniperus monosperma* | | 11.56 | | | | | | | | | 40.16 | | | | |
| *Larrea divaricata* | 18.44 | 1.13 | 1.66 | 2.73 | 26.82 | 1.38 | 25.1 | 37.0 | 2.02 | | 1.21 | | | | |
| *Cowania mexicana* | | | | | | | | | | | 1.48 | | | | |
| *Gutierrezia* spp. | 2.61 | | 6.45 | 2.86 | 1.0 | 18.02 | | 2.45 | 9.46 | | 8.82 | 8.14 | | 4.49 | |
| *Aloysia wrightii* | | | | | | | | | | | 1.50 | | | | |
| *Opuntia* (smooth) | | | | | | | | | | | 1.08 | | | | |
| *Quercus turbinella* | | | 3.73 | | | | | | | | 2.50 | 34.28 | | 4.19 | |
| *Pinus monophylla* | | | | | | | | | | | 7.26 | | | | |
| *Ceanothus greggii* | | | | | | | | | | | 1.11 | 19.11 | | 1.13 | |
| *Artemesia tridentata* | | | | | | | | | | | 3.05 | | | | |
| *Acacia greggii* | | | 4.12 | | | 1.65 | 2.28 | 3.15 | 3.4 | | | | 12.3 | 5.33 | |
| *Salizarrin mexicana* | | | 4.40 | 2.74 | 1.79 | 3.02 | | 1.4 | | | | | | | 5.26 |
| *Opuntia* (cholla) | | | 4.58 | 2.07 | | | 2.38 | | 3.10 | | | | | | 1.03 |
| *Aplopappus laricifolius* | | | 1.85 | 1.37 | | | | | | | | 11.16 | | 6.51 | |
| *Hymenoclea salsola* | | | 2.03 | 34.6 | | | | 1.2 | 4.42 | 1.52 | | | 29.23 | | 25.38 |
| *Janusia gracilis* | 1.1 | | 1.18 | | | | | | | | | | | | |
| *Krameria parvifolia* | 2.5 | | 3.85 | 1.78 | 4.22 | 1.17 | 1.43 | 5.9 | | | | | | | |
| *Acampotapappus sphaerocephalus* | | | 2.43 | 6.86 | | 23.25 | 6.43 | 8.1 | 16.33 | 4.58 | | | | | 6.19 |
| *Ambrosia dumosa* | | | | 3.51 | 17.78 | | 5.26 | 9.66 | 1.39 | | | | | | |
| *Opuntia* spp. (cholla) | | | | 2.65 | | | | | 12.15 | | | | | | |
| *Canotia holacantha* | | | | 1.62 | | | | | | | | | | | |
| *Opuntia* spp. (cholla) | | | | | | | 2.35 | | | | | | | | |
| *Thamnosma montana* | | | | | | | 2.8 | | | | | | | | |
| *Yucca brevifolia* | | | | | | | 4.39 | | | | | | | | |
| *Atriplex confertifolia* | | | | | | | | | | 25.69 | | | | | |
| *Atriplex canescens* | 3.9 | | | | | | | | | 7.24 | | | | | |
| *Encelia farinosa* | | | | | 22.2 | | | | | | | | | | |
| *Eriogonum wrightii* | | | | | | | | | | | | | | 1.33 | |
| *Opuntia* spp. | | | | | | | | | | | | | | 16.77 | |
| *Nolina microcarpa* | | | | | | | | | | | | | | 1.84 | |
| *Garrya* wrightii | | | | | | | | | | | | 5.84 | | | |
| *Arctostaphlos pungens* | | | | | | | | | | | | 8.08 | | | |
| *Rhus trilobata* | | | | | | | | | | | | 2.28 | | | |
| *Amelanchier bakeri* | | | | | | | | | | | | 1.28 | | | |
| *Rhamus crocea* | | | | | | | | | | | | 1.15 | | | |
| *Psilotrophe cooperi* | | | | | | | | | 1.08 | | | | | | |
| *Gutierrezia microcephala* | | | | | | | | | 9.31 | | | | | | |
| Others (insignificant) | 1.58 | 3.55 | 11.49 | 4.45 | | 4.86 | 7.24 | 6.10 | 7.80 | 3.20 | 6.88 | 5.92 | 3.45 | 3.1 | 1.43 |
| Total Percent Species Composition | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

*The average percent crown cover is a total (percent) of the vegetation subtype occupied by all plants. The 100% total by species composition under each subtype comprises the average crown cover for that subtype.

**Source:** Vegetation Data Collection Method, Arthur D. Little, Inc. (Appendix E). In arriving at these data, 28 specific representative sites were studied. At each site, an average of 24.89 100-ft by 1-ft transects were run. This equates to an average of 2489 sq ft per study site.

Table II-13

RANGE CONDITION BY MAJOR VEGETATION SUBTYPES
(BLM) BY ALLOTMENT

| Vegetative Composition Each Allotment | Vegetative (Range) Condition Classification by Acres Each Vegetative Type: Poor | Fair | Good | Miscellaneous | Total Acres |
|---|---|---|---|---|---|
| **Big Ranch 7A** | | | | | |
| Desert Shrub | 10,472 | 93,967 | 17,923 | | 122,362 |
| Creosote Bush | 6,658 | 32,401 | 2,704 | | 41,763 |
| Pinyon-Juniper | 2,094 | | | | 2,094 |
| Miscellaneous | | | | 1,250 | 1,250 |
| | 19,224 | 126,368 | 20,627 | 1,250 | 167,469[a] |
| **Black Mountain 10A** | | | | | |
| Desert Shrub | | 18,349 | | | 18,349 |
| Creosote Bush | 69,121 | | | | 69,121 |
| Half-shrub | | 30,364 | | | 30,364 |
| | 69,121 | 48,713 | | | 117,834[b] |
| **Cane Springs 15A** | | | | | |
| Desert Shrub | 10,782 | 25,859 | | | 36,641 |
| Creosote Bush | 11,959 | 3,144 | | | 15,103 |
| Pinyon-Juniper | | 6,531 | | | 6,531 |
| Half-shrub | 624 | 7,538 | | | 8,162 |
| Saltbush | | 8,569 | 503 | | 9,072 |
| Winter Fat | | 930 | | | 930 |
| Conifer | 544 | 148 | | | 692 |
| Grass | 1,560 | 4,660 | | | 6,220 |
| Annuals | 1,812 | 4,289 | 739 | | 6,840 |
| Miscellaneous | | | | 16,275[c] | 16,275 |
| | 27,281 | 61,668 | 1,242 | 16,275 | 106,466 |
| **Canyon Ranch 17A** | | | | | |
| Desert Shrub | 3,544 | 21,169 | 3,562 | | 28,275 |
| Creosote Bush | 96 | 497 | | | 593 |
| Pinyon-Juniper | 2,184 | 4,327 | | | 6,511 |
| Half-shrub | 3,805 | 7,311 | 3,336 | | 14,452 |
| Mountain Shrub | 1,127 | 5,199 | | | 6,326 |
| Winter Fat | | 159 | | | 159 |
| Annuals | 617 | 867 | | | 1,484 |
| | 11,373 | 39,529 | 6,898 | | 57,800 |
| **Castle Rock 18A** | | | | | |
| Desert Shrub | | 5,978 | | | 5,978 |
| Pinyon-Juniper | 1,336 | | | | 1,336 |
| Half-shrub | | 3,215 | | | 3,215 |
| Miscellaneous | | | | 334 | 334 |
| | 1,336 | 9,193 | | 334 | 10,863 |
| **Cedar Canyon 19A** | | | | | |
| Desert Shrub | 628 | 9,258 | 7,640 | | 17,526 |
| Creosote Bush | 3,351 | 778 | 279 | | 4,408 |
| Pinyon-Juniper | | 630 | 5,077 | | 5,707 |
| Half-shrub | 1,650 | 5,699 | 1,128 | | 8,477 |
| Mountain Shrub | | 896 | 3,313 | | 4,209 |
| Saltbush | | 26,302 | | | 26,302 |
| Grass | | 6,474 | 759 | | 7,233 |
| Annuals | 209 | 11,237 | 2,544 | | 13,990 |
| Miscellaneous | | | | 391 | 391 |
| | 20,740 | 61,274 | 5,838 | 391 | 88,243 |
| **Clay Springs 23A** | | | | | |
| Desert Shrub | 158 | 4,324 | 915 | | 5,397 |
| Creosote Bush | 662 | 1,303 | | | 1,965 |
| Half-shrub | | 2,242 | 407 | | 2,649 |
| Pinyon-Juniper | | 1,821 | | | 1,821 |
| Mountain Shrub | | 566 | | | 566 |
| Miscellaneous | | | | 487 | 487 |
| | 820 | 10,256 | 1,322 | 487 | 12,885 |
| **Crozier Canyon 26A** | No Current Data Available | | | | |

Table II-13 (Continued)

| Vegetative Composition Each Allotment | Vegetative (Range) Condition Classification by Acres Each Vegetative Type | | | | |
|---|---|---|---|---|---|
| | Poor | Fair | Good | Miscellaneous | Total Acres |
| **Cerbat/Quail Springs/Turkey Track 20A** | | | | | |
| Desert Shrub | 3,108 | 26,515 | 3,334 | | 32,957 |
| Creosote Bush | | 633 | | | 633 |
| Half-shrub | 1,107 | 9,762 | | | 10,869 |
| Pinyon-Juniper | 915 | 14,516 | 2,541 | | 17,972 |
| Mountain Shrub | 92 | 5,016 | 256 | | 5,364 |
| Grass | 311 | 1,082 | | | 1,393 |
| Miscellaneous | | | | 377 | 377 |
| | 5,533 | 57,524 | 6,131 | 377 | 69,565 |
| **Curtain 27A** | | | | | |
| Desert Shrub | | 205 | | | 205 |
| Creosote Bush | | 1,845 | | | 1,845 |
| Grass | | 1,620 | | | 1,620 |
| | | 3,670 | | | 3,670 |
| **Diamond Bar/Gold Basin 29A** | | | | | |
| Desert Shrub | 52,548 | 108,150 | 2,740 | | 163,438 |
| Creosote Bush | 1,676 | 2,977 | | | 4,653 |
| Half-shrub | 190 | 3,309 | 276 | | 3,775 |
| Pinyon-Juniper | | 16,643 | 2,648 | | 19,291 |
| Mountain Shrub | 2,457 | 3,517 | | | 5,974 |
| Sagebrush | 180 | | | | 180 |
| | 57,051 | 134,596 | 5,664 | | 197,311[d] |
| **Dolan Springs 30A** | | | | | |
| Desert Shrub | 916 | 33,500 | 5,465 | | 39,881 |
| Creosote Bush | 5,478 | 24,519 | 444 | | 30,441 |
| Half-shrub | | 1,251 | | | 1,251 |
| Pinyon-Juniper | | 647 | | | 647 |
| Grass | | | 821 | | 821 |
| | 6,394 | 59,917 | 6,730 | | 73,041 |
| **Ft. McEwen 34A** | | | | | |
| Desert Shrub | 6,585 | 23,164 | | | 29,749 |
| Creosote Bush | | 19,502 | | | 19,502 |
| Pinyon-Juniper | | 9,875 | 2,036 | | 11,911 |
| Miscellaneous | | | | 44,686 | 44,686 |
| | 6,585 | 52,541 | 2,036 | 44,686 | 105,848[e] |
| **Gediondia 36A** | | | | | |
| Desert Shrub | 3,813 | 4,246 | 321 | | 8,380 |
| Creosote Bush | 245 | 6,666 | 1,427 | | 8,338 |
| Pinyon-Juniper | 464 | 2,598 | 244 | | 3,306 |
| Grass | | | 164 | | 164 |
| Miscellaneous | | | | 691 | 691 |
| | 4,522 | 13,510 | 2,156 | 691 | 20,879 |
| **Hackberry 42A** | | | | | |
| Desert Shrub | 10,002 | 46,303 | 13,291 | | 69,596 |
| **Mineral Park 55A** | | | | | |
| Desert Shrub | | 3,938 | | | 3,938 |
| Half-shrub | | 8,013 | | | 8,013 |
| Pinyon-Juniper | | 1,884 | 130 | | 2,014 |
| Mountain Shrub | | 1,806 | 811 | | 2,617 |
| Miscellaneous | | | | 1,449 | 1,449 |
| | | 15,641 | 941 | 1,449 | 18,031 |
| **Mt. Tipton 58A** | | | | | |
| Desert Shrub | 5,183 | 2,568 | | | 7,751 |
| Creosote Bush | 420 | | | | 420 |
| Half-shrub | | 2,496 | | | 2,496 |
| Pinyon-Juniper | 3,422 | | | | 3,422 |
| Miscellaneous | | | | 197 | 197 |
| | 9,025 | 5,064 | | 197 | 14,286 |

TABLE II-13 (Continued)

| Vegetative Composition Each Allotment | Poor | Fair | Good | Miscellaneous | Total Acres |
|---|---|---|---|---|---|
| | Vegetative (Range) Condition Classification by Acres Each Vegetative Type | | | | |
| Mud Springs 56A | | | | | |
| Desert Shrub | 355 | 7,890 | 2,259 | | 10,504 |
| Creosote Bush | 2,906 | 19,655 | 4,904 | | 27,465 |
| Half-shrub | | 2,395 | 174 | | 2,569 |
| Pinyon-Juniper | 423 | 7,801 | 2,506 | | 10,730 |
| Mountain Shrub | | 177 | 69 | | 246 |
| Grass | | 1,718 | 318 | | 2,036 |
| Miscellaneous | | | | 120 | 120 |
| | 3,684 | 39,636 | 10,230 | 120 | 53,670 |
| Music Mountain 57A | | | | | |
| Desert Shrub | | 46 | | | 46 |
| Half-shrub | | 73 | 179 | | 252 |
| Pinyon-Juniper | 1,055 | 7,856 | 3,627 | | 12,538 |
| Mountain Shrub | 259 | 5,285 | 1,071 | | 6,615 |
| Sagebrush | 374 | 380 | | | 754 |
| | 1,688 | 13,640 | 4,877 | | 20,205 |
| Pine Springs 60A | | | | | |
| Desert Shrub | | 2,783 | 3,195 | | 5,978 |
| Half-shrub | | 1,764 | | | 1,764 |
| Pinyon-Juniper | | | 233 | | 233 |
| | | 4,547 | 3,428 | | 7,975 |
| Portland Spring 61A | | | Ephemeral | | |
| Silver Creek 65A | | | Ephemeral | | |
| Stockton Hill 66A | | | | | |
| Desert Shrub | | 952 | 1,115 | | 2,067 |
| Pinyon-Juniper | | 971 | 614 | | 1,585 |
| Mountain Shrub | | 280 | | | 280 |
| | | 2,203 | 1,729 | | 3,932 |
| Thumb Butte 68A | | | Ephemeral | | |
| Truxton Canyon 70A | | | | | |
| Desert Shrub | 161 | 3,491 | 1,272 | | 4,924 |
| Half-shrub | | | 193 | | 193 |
| Pinyon-Juniper | | 427 | 4,880 | | 5,307 |
| Mountain Shrub | | 1,781 | 157 | | 1,938 |
| Mesquite | | | 234 | | 234 |
| Miscellaneous | | | | 70 | 70 |
| | 161 | 5,699 | 6,736 | 70 | 12,666 |
| Upper Music 71A | | | | | |
| Desert Shrub | 492 | 11,626 | | | 12,118 |
| Creosote Bush | 3,954 | 6,063 | | | 10,017 |
| Half-shrub | | 272 | | | 272 |
| Pinyon-Juniper | 793 | | | | 793 |
| Mountain Shrub | 906 | | | | 906 |
| Grass | | 3,159 | | | 3,159 |
| Salt Bush | | 1,626 | | | 1,626 |
| | 6,145 | 22,746 | | | 28,891[f] |

a. Acreage under grazing systems — excluding ephemeral range.
b. Includes custodial range.
c. Includes acreage in Red Lake (14,654) and additional waste.
d. Excludes ephemeral acreage.
e. Includes custodial and ephemeral (here listed under miscellaneous).
f. Includes only desert portion of allotment. No data available on mountain portion of allotment.

**Source:** American Ag International Vegetative Survey, 1977.

- Minimal sampling (insufficient to accumulate information for Table II-13) of several sites on the Crozier Canyon allotment in late August and early September would indicate the need for an intensive survey prior to the implementation of the deferred grazing system, in order to get the initial stocking rates in line with what appears to be very low current forage production. The most recent survey conducted on this allotment by the BLM was completed in 1958, and this information does not reflect present conditions.

(Note: During field tests run in southern Arizona,[52] the effects of rest schedules on perennial grass production were almost obscured by large year-to-year differences in rainfall and grass production. Soil site relationships appeared to be critical to range response, as the variability of different rest schedules compared to yearlong grazing (all under proper stocking) yielded negligible results. Under the test conditions alternate year seasonal rest did not provide sufficient time for recovery of the range between grazing periods.

The extreme variability and reliability of rainfall within the ES area continues to be an overriding concern as regards successful implementation of variations of long-term rest rotation grazing systems as planned. This emphasizes the need for incremental institution of these systems in order to assure flexibility to meet changing needs on-site.

c. Threatened and Endangered Plants

The plants described below and occurring in the ES area are on endangered and threatened plant species lists, specifically House Document 94-51 (1975) and BLM lists.[53] The number for each species corresponds to the numeral on Figure II-13; the distribution is based upon available data. Table II-14 shows the known distribution for each taxon and allotments on which each entity could possibly occur (based on the criteria noted).

The name, phenology, habitat, economic importance, and status are as follows:

- *Agave mckelveyana* (no common name - ncn). A perennial succulent shrub, occurring with *Juniperus californica* and Desertscrub vegetation in the Black Mountains, and in the Scrubland and Woodland formations from 2500-7200 feet, on rocky volcanic slopes and flats. This species lives in a better watered and cooler habitat than its nearest relative, *Agave deserti*, and its habit of growing among shrubbery keeps it obscure.[54] It grows in small scattered populations. It flowers May-July, and fruits through December; its lifespan is unknown. The inflorescence and fling shoots are palatable. Endangered.

**TABLE II-14**

**KNOWN DISTRIBUTION OF THREATENED AND ENDANGERED PLANT SPECIES IN ES AREA, AND ALLOTMENTS OF POSSIBLE OCCURRENCE***

| Threatened/Endangered | Known Occurrence and Allotment | Possible Occurrence |
|---|---|---|
| *Agave mckelveyana* | Near Oatman – Black Mountain and Silver Creek<br>Dolan Springs – Dolan Springs | Mud Springs<br>Gediondia<br>Ft. McEwen |
| *Astragalus lentiginosus* var. *ambiguus* | Pierce Ferry – Diamond Bar/Gold Basin<br>Chloride – Cerbat/Quail Springs/Turkey Track | Any allotment |
| *Crossosoma parviflora* | Black Hills near Oatman – Black Mountain and Silver Creek<br>Bonelli Landing – Big Ranch | Portland Spring<br>Ft. McEwen<br>Thumb Butte<br>Gediondia<br>Diamond Bar/ Gold Basin |
| *Encelia farinosa* var. *phenicodonta* | Davis Dam – Thumb Butte<br>Willow Beach – Big Ranch | Ft. McEwen<br>Portland Spring |
| *Encelia frutescens* var. *resinosa* | Silver Creek | |
| *Fraxinus cuspidata* var. *macropetala* | Chloride – Cerbat/Quail Springs/Turkey Track | Music Mountain<br>Upper Music<br>Clay Springs |
| *Opuntia basilaris* var. *treleasei* | Willow Beach – Big Ranch, Mineral Park, and Cerbat/Quail Springs/Turkey Track | Castle Rock<br>Pine Springs<br>Clay Springs<br>Feldspar<br>Jones Spring |
| *Penstemon bicolor* sub sp. *roseus* | Portland Mine to Chloride – Portland Spring, Ft. McEwen, and Cerbat/Quail Springs/ Turkey Track | Mud Springs |
| *Sophora arizonica* | East of Truxton – Crozier<br>One mile north of Kingman – Private | Cook Canyon<br>Truxton Canyon<br>Valentine<br>Music Mountain<br>Upper Music<br>Clay Springs |

**Source:** Museum of Northern Arizona.

• Astragalus lentiginosus var. ambiguus (freckled milk vetch). A coarse perennial, occurring on open hillsides on limestone and granitic soils, from 1000-4800 feet in the Desertscrub and Woodland formations. It flowers in April and May, and is local, forming colonies. It is possibly eaten by pronghorn. Threatened.

• Crossosoma parviflora (ncn). Shrub, occurring from 3500-5000 feet in the Woodland Formation; flowering in March. Its palatability is unknown. Threatened.

• Encelia farinosa var. phenicodonta (brittlebush). Low shrub occurring in the creosote bush-bur sage community of the Desertscrub Formation at 1500 feet, on rocky hills, flats, and in washes. It flowers and fruits in March and April. The species is common but the variety is rare and occurs in isolated patches. The variety is dormant or non-flowering from May to November and cannot be recognized during that time.[55] It is browsed by burros and bighorns (probably most ungulates). Threatened.

• Encelia frutescens var. resinosa (bush encelia). Low shrub occurring from 4500-5500 feet on rocky slopes and mesas in the high Desertscrub to Woodland formations. It flowers January-September. Its palatability is unknown. Threatened.

• Fraxinus cuspidata var. macropetala (flowering ash). Large shrub to small tree occurring between 5500 to 7000 feet in rocky limestone canyons or cliff-faces in the Woodland Formation, associated with pinyon, juniper, serviceberry, hop tree, snowberry, and squawbush. It flowers April through June, is locally common, and is not palatable. Threatened.

• Opuntia basilaris var. treleasei (beavertail cactus). Perennial occurring on sandy flats and low hills in the grasslands of the Desertscrub, from 400-3800 feet; flowers March and April. It is possibly eaten by burros, but is not eaten by livestock. Endangered.

• Penstemon bicolor subsp. roseus (beard tongue). Occurs with creosote bush on outwash fans at 2500 feet in the Desertscrub Formation; flowers in the spring. It is very rare, and of unknown palatability. Threatened.

• Sophora arizonica (ncn). A shrub occurring with Mohave thorn, juniper, and shrub live oak on limestone and gypsum at 3700 feet in the Woodland Formation (occurs on many different rock types outside the ES area).[56] It flowers and fruits from March through June. Palatability is unknown. Threatened.

Several other species on the threatened and endangered lists are known from localities in the ES area, and have the potential to occur in suitable habitats there. These, listed below with known nearby locations and status, are:

- *Astragalus titanophilus* var. *barneby* (ncn). Peach Springs. Threatened.

- *Agave utahensis* var. *kaibabensis* (Utah agave). Lower Grand Canyon, Rampart area. Threatened.

- *Coryphantha vivipera* var. *rosea* (ncn). Peach Springs. Threatened.

- *Camissonia specuicola* var. *hersparia* (ncn). Hualapai Canyon; separation to Spencer Canyons. Threatened.

- *Eriogonum ripleyi* (wild buckwheat). Grand Canyon Caverns. Threatened.

- *Opuntia phaeacantha* var. *superbospina* (Engelmann's prickly pear). Hualapai Mountains, 13 miles southeast of Kingman. Threatened.

- *Opuntia whipplei* var. *multigeniculatus* (Whipple's cholla). Peach Springs. Threatened.

d. Poisonous Plants

The effect of poisonous plants on livestock is compounded by the nature of the plants and their toxins. Some plants are always toxic, others are seasonally and occasionally toxic dependent upon stress factors caused principally by sharply fluctuating temperatures or rapid regrowth following moisture extremes. Some of the preferred forage plants occasionally become highly toxic through the accumulation of excess quantities of nitrates, hydrocyanic acid, selenium, and other substances.

Economic losses to the livestock industry from poisonous plants are reflected not only in actual death loss, but in sublethal and/or chronic poisoning. This type of toxicity causes unquantifiable economic losses in the form of poor condition, weight loss, conception problems, abortions, and, because of poor condition, susceptibility to disease.

It should also be noted that wildlife, particularly the ungulates, are not immune to plant poisoning. The same plant poison potential exists for burros and wild horses.

For the range livestock industry in the 11 western states, annual death loss from poisonous plants between 1951 and 1960 is estimated to exceed $23 million.[57] Few other causes of economic loss to the livestock industry exceeded those occurring from the consumption of poisonous plants.

Within the Cerbat/Black Mountain ES area 13 major poisonous plants have been identified; 17 poisonous plants are of secondary importance, and 15 are identified as suspect or rarely causing toxicity. (See Tables II-15, II-16, and II-17.)

TABLE II-15

## OCCURRENCE OF MAJOR POISONOUS RANGE PLANTS<br>CERBAT/BLACK MOUNTAIN ES AREA

| Scientific Name | Common Name | Poisonous Principle | Remarks |
|---|---|---|---|
| *Aplopappus* sp. | Turpentine Bush, Goldenweed | Higher alcohol (tremetol) | The cumulative ingestion of the highly toxic tremetol causes "trembles" in livestock. The toxin is transferable through the dam's milk, hence can poison the suckling young. Humans have also been poisoned from the milk of cows that were toxic. This is called "milk sickness." |
| *Acacia constricta* | Common Whitethorn | Hydrocyanic acid | The plants are high in cyanide-forming compounds, and have caused livestock death in Arizona. The problem can occur in the fall of the year at or near frost time. Cattle may consume leaves when grasses are less palatable or unavailable. |
| *Amaranthus palmeri* | Careless Weed, Pigweed | Nitrate | Pigweed under favorable growth conditions will store high concentrations of nitrates. This most often occurs when the plant grows rapidly and often follows a growth period after wilt. Summer annual. |
| *Asclepias subverticillata (A. galioides)* | Whorled Milkweed | Glycosides and Resins | Milkweed is highly unpalatable and is most often consumed along with other plants. It is most common in disturbed areas such as ditch banks, along roads and trails. |
| *Astragalus* sp. | Locoweed | Alkaloid-like (locoine), Selenium | Commonly occurs everywhere and is the greatest problem in spring and early summer before other perennial forage plants are green. Causes typical "loco" poisoning, selenium toxicity, and a respiratory-type poisoning. |
| *Cercocarpus* sp. | Mountain Mahogany | Hydrocyanic acid | Though excellent browse for livestock and wildlife, cyanic poisoning can occur particularly in the fall after initial frost. |
| *Delphinium* sp. | Larkspur | Diterpenoid alkaloids | A highly toxic plant that is most toxic prior to flowering, usually in the spring months. Cattle seem to be more susceptible than other grazers. |
| *Gutierrezia microcephala (G. sarothrae)* | Snakeweed | Saponin selenium | Major economic losses in Arizona have been attributed to snakeweed causing extensive abortion, death, weak and lightweight calves, and placenta retention. |
| *Psilostrophe cooperi* | Whitestem Paperflower | Unknown toxin | The poisonous principle is unknown, though most toxicity in livestock has occurred in the fall and winter. |
| *Salsola kali* | Russian Thistle, Tumbleweed | Nitrate (possibly oxalate) | Highly palatable annual weed that is common in disturbed areas and on depleted ranges. Most palatable in young stages of growth and has been responsible for extensive death loss. |
| *Senecio douglasii* | Douglas Groundsel | Pyrrolizidine alkaloids | Cattle and horses are equally sensitive to the poisonous principle which affects the liver. Senecio is highly toxic and has caused significant economic loss. |
| *Sorghum halepense* | Johnson Grass | Hydrocyanic acid; nitrates to some degree | Most common in disturbed areas along roads and trails in low spots with additional moisture. Most toxic immediately following frost. When cured, toxicity is diminished. |
| *Xanthium saccharatum* | Cocklebur | Glycoside (hydroquinone) | Particular problem in low areas receiving excess water, and around water tanks. The highly toxic glycoside is most toxic in the cotyledon and three-leaf stages of growth. As true leaves develop, toxicity is reduced. |

**Source:** E.M. Schmutz, B.N. Freeman, and R.E. Reed, *Livestock-poisoning Plants of Arizona*, University of Arizona Press, Phoenix, 1968.

TABLE II-16

OCCURRENCE OF SECONDARY POISONOUS RANGE PLANTS
CERBAT/BLACK MOUNTAIN ES AREA

| Scientific Name | Common Name | Poisonous Principle | Remarks |
|---|---|---|---|
| *Acacia greggii* | Catclaw | Hydrocyanic acid | Most common in fall after frost |
| *Baileya multiradiata* | Desert Marigold | Unknown water-soluble compound | Only a problem when large quantities consumed. |
| *Claviceps* sp. | Ergot | Numerous alkaloids (gangrenous ergotism compound) | Fungus parasitizes developing ovary in flower of several grasses including *Hilaria* and *Poa*. |
| *Datura meteloides* | Sacred Datura | Solanaceous alkaloids | Rarely consumed, though highly toxic if consumed. Equally toxic to humans (seeds in particular). |
| *Descurainia pinnata* | Tansy Mustard | Unknown toxin | Livestock poisoning symptoms similar to "blind staggers" caused by selenium. |
| *Erodium cicutarium* | Filaree, Alfilaria | Nitrate | A preferred annual forage that periodically causes extensive death loss due to high nitrate content. |
| *Euphorbia* sp. | Spurge | Unknown toxins and hydrocyanic acid | The milky juice may cause skin irritation, diarrhea, photosensitization, and cyanogenetic poisoning. |
| *Lupinus* sp. | Lupine | Numerous alkaloids | Provides moderately palatable forage, though some species are toxic. Besides death, can cause "crooked calf" disease. |
| *Nicotiana* sp. | Desert Tobacco | Numerous alkaloids (nicotine) | Though unpalatable, numerous losses have been recorded. Equally toxic to humans. |
| *Nolina microcarpa* | Bear Grass | Unknown toxin | Evergreen leaves are non-toxic. Toxin occurs in flower buds, flowers, and stalks. Excessive use may cause photosensitization. |
| *Notholaena sinuata* | Jimmyfern | Unknown toxin | Rarely a problem. Danger period is November-February. |
| *Oxytenia acerosa* | Copperweed | Unknown toxin | Rarely consumed, as very unpalatable. |
| *Prunus* sp. | Chokecherry | Hydrocyanic acid | Highly toxic; most common in spring and early summer. |
| *Quercus gambelli* | Gambel Oak | Tannic acid and other toxins | Most common in early spring; problem occurs from consumption of buds and immature leaves. |
| *Solanum* sp. | Horsenettle, Nightshade | Glycoalkaloid (solanine) | Generally occurs in disturbed areas or low-lying areas. Highly toxic, though normally not a major problem. |
| *Tetradymia* sp. | Horsebrush | Light-reacting substance | Causes photosensitization. Does not affect cattle. |
| *Viguiera* sp. | Goldeneye | Suspected nitrate and/or hydrocyanic acid | Annual species of this genus seasonally toxic. |

**Source:** E.M. Schmutz, B.N. Freeman, and R.E. Reed, *Livestock-poisoning Plants of Arizona*, University of Arizona Press, Phoenix, 1968.

TABLE II-17

RARELY POISONOUS AND SUSPECTED POISONOUS RANGE PLANTS
CERBAT/BLACK MOUNTAIN ES AREA

| Scientific Name | Common Name | Poisonous Principle | Remarks |
|---|---|---|---|
| *Aloysia wrightii* | White Brush, Mintbush | Unknown water-soluble compound | Has caused cattle and horse poisoning under forced use. |
| *Baccharis pteronoides* | Yerba de Pasmo | Unknown toxin | Poisoning, though rare, has been attributed to this plant. |
| *Castilleja chromosa* | Desert Indian Paintbrush | Selenium | Various species are secondary or facultative selenium absorbers. |
| *Chrysothamnus nauseosus* | Big Rabbitbrush | Unknown toxin | Unpalatable; forced feeding has confirmed toxicity. |
| *Comandra pallida* | Pale Bastard, Toadflax | Selenium | This root-parasitic forb is a secondary or facultative selenium absorber. |
| *Dyssodia* sp. | Dogweed | Unknown toxin | Suspected of causing injury and death to livestock. |
| *Grayia spinosa* | Spiny Hopsage | Selenium | Suspected of being a secondary or facultative selenium absorber. |
| *Hilaria rigida* | Big Galleta | Unknown toxin | Suspected of causing sudden death loss of cattle, though toxic principle has not been isolated. |
| *Juniperus monosperma* | One-seed Juniper | Unknown volatile substances | Forced use of large quantities of herbage has caused abortion in livestock. |
| *Lepidium fremontii* | Desert Pepperweed | Unknown toxin | May cause poisoning if consumed in large amounts. |
| *Machaeranthera tortifolia* | Mohave Aster | Selenium | Species of *Machaeranthera* are known to be secondary or facultative selenium absorbers. |
| *Penstemon* sp. | Penstemon | Selenium | Species of *Penstemon* are known to be secondary or facultative selenium absorbers. |
| *Physalis fendleri* | Fendler Groundcherry | Probably an alkaloid | It is suspected that cattle have been poisoned from eating the fruit and tops of *Physalis.* |
| *Ptelea angustifolia* | Hoptree | Unknown toxin | May cause severe dermatitis and photosensitization. |
| *Robinia neomexicana* | New Mexican Locust | Possibly a phytotoxin or a glyoside | Suspected of being toxic to livestock. |

*Source:* E.M. Schmutz, B.N. Freeman, and R.E. Reed, *Livestock-poisoning Plants of Arizona,* University of Arizona Press, Phoenix, 1968.

The categories of major, secondary, and rarely and suspected poisonous range plants are further defined as:

- Major Poisonous Range Plants - those plants that due to inherent toxicity, occurrence, and palatability, historically are the major cause of livestock poisoning.

- Secondary Poisonous Range Plants - those toxic plants that, due to occurrence and palatability, are a secondary cause of animal poisoning.

- Rarely Poisonous and Suspected Poisonous Range Plants - those plants that, though toxic, are rarely consumed; and those plants that are suspected of being toxic though are unconfirmed as such.

Because of the diverse nature of the various toxic plants existent in the ES area, it would be impossible to identify by site the areas of occurrence of each species within each allotment.

In general, such toxic plants as careless weed (*Amaranthus palmeri*), Johnson grass (*Sorghum halapense*), Russian thistle (*Salsola kali*), lupine (*Lupinus* spp.), horse nettle (*Solanum* spp.), and ground-cherry (*Physalis fendleri*) are most common in disturbed sites along roads, trails, and livestock-handling facilities, as well as near improved waters and in the low-lying areas that receive additional water from runoff.

Gambel oak (*Quercus gambelii*) and mountain mahogany (*Cercocarpus* spp.) are found only in the higher elevations of the Cerbat and Music mountains. One-seed juniper (*Juniperus monosperma*) and bear grass (*Nolina microcarpa*) are found in the mid- to higher elevations of the Black, Cerbat, and Music mountains within the ES area. Copperweed (*Oxytenia acerosa*) is found only in isolated, sandy washes that drain into the Colorado River in the northeastern portion of the ES area.

e. Ephemeral Ranges

Those public land acres designated as ephemeral rangelands lie at the lower elevations of the western and northern portions of the ES area immediately adjacent to, and including much of, the Lake Mead National Recreation Area. Of the 635,866 acres of public land designated as ephemeral, 383,866 lie within the Lake Mead Recreation Area (Table I-1). These rangelands include the entire Silver Creek, Thumb Butte, and Portland Spring allotments, and substantial portions of the Big Ranch, Diamond Bar/Gold Basin, and Ft. McEwen allotments.

These allotments and portions thereof are designated as ephemeral by nature of their geographic, edaphic, and climatic positions within the ES area.[58]

Rangeland use of ephemerally designated ranges within the ES area can be categorized as occasional, seasonal, and variable in terms of livestock numbers. It is doubtful that management techniques could convert such annual ranges to perennial; hence management should be based upon the annual vegetation.[59] Use problems associated with ephemeral ranges include the extreme variation in annual forage production from year to year, which makes establishment of grazing capacities or management systems difficult. The occasional use pattern on such lands does not justify extensive range improvements such as the development of additional permanent waters, etc., to service the area.

Significant annual species providing spring forage during years of ample rainfall include alfilaria (Erodium cicutarium), Indian wheat (Plantago purshii and P. insularis), annual bromes (Bromes rubens and B. arizonicus), Mediterranean grass (Shismus barbatus), six weeks fescue (Festuca octoflora), and numerous other annual forbs.

These spring growing annuals provide highly palatable and nutritious feed for relatively short periods of time. After curing, the nutritional value rapidly diminishes. Hence, any unreasonable delay in the use season of annual ranges when they have feed will result in an inability to take advantage of this occasionally available forage.

These ephemerally designated ranges have not been classified as to range condition because of their ephemeral nature. Range condition classification presumes a perennial forage base.

There are no grazing capacity figures allotted to ephemeral allotments as such numbers are seasonally determined by BLM range conservationists as on-site forage availability dictates. Such annual forage production potential from the ephemeral allotments will occur from February through May of those years with sufficient winter precipitation.

f. Custodial Management

Custodially-managed allotments within the ES area are under status quo or "caretaker" management. Whether designated custodial by nature of their minimal amount of Federal lands within the allotment boundaries,* or because of an MFP decision to transfer such lands out of Federal ownership (Table I-14),** these allotments have no plans for the introduction of improvements or grazing management. Exclusive of issuing grazing licenses on the basis of estimated grazing capacity of the Federal range of the four allotments containing a combined total of 7.8% Federal lands, the BLM does not control livestock numbers on these custodial allotments. These allotments are generally located near Kingman and/or adjacent to the main highway arteries traversing the southern portion of the ES area. Those designated for ultimate disposal do not have livestock number adjudicated even on the Federal portions.

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*Feldspar, Long Mountain, Peacock Mountain, and West Peacock combined contain 9410 out of 120,546 acres, or 7.8% Federal lands.

**Cook Canyon, Jones Spring, Valentine, and Hualapai Ranch which combined contain 19,614 of 60,039 acres, or 32.7% Federal lands.

In addition to the eight custodial allotments within the ES area, significant portions of seven other allotments under AMPs* (Table I-3) are designated as custodial. The custodial acreage within these seven allotments is managed in line with custodial designation. Livestock numbers are controlled on three allotments (Black Mountain, Cane Springs, and Cedar Canyon), but not controlled on three others (Castle Rock, Ft. McEwen, and Canyon Ranch). (See Table I-12.) The seventh allotment with custodial designation is Thumb Butte which is ephemeral, and as such, has no number control considerations as the Ephemeral Range Special Rule [60] would take precedence.

Current fencing on the Cedar Canyon, Cane Springs, and Ft. McEwen allotments basically separates the custodial acreages from the management units, thus permitting degrees of management on such custodial units by nature of controlling livestock numbers in relation to estimated grazing capacity. Though Ft. McEwen is <u>not</u> designated as a custodial livestock control unit, the separate pasture permits such control.

Range use problems symptomatic of the three allotments under AMPs, but without fences separating custodial from the management acreages, are the intermingling of livestock numbers between units which precludes intensive management of the non-custodial or management portions.

g. Vegetative Manipulation

<u>Blackbrush Burning and Reseeding</u>. The 1920 acres of blackbrush (800 BLM and 1120 private) selected for burning and seeding on the Mt. Tipton allotment lie within the Barkerville-Gaddes-Rock Outcrop Association. The soils are gravelly sandy loam or gravelly loamy sand over weathered granite over bedrock. The slopes at the selected site are quite moderate, less than 10%. The soils are moderately deep, though there are rock outcrop intrusions where the soils are very shallow, 0-4 inches. The runoff potential is moderately high on the deeper soil sites and high where the rock outcrop intrusions exist. Erosion hazard is slight to moderate (Table II-3). This site lies in the lower outwash fans on the west side of Mt. Tipton a few miles from the community of Dolan Springs. The site precipitation approximates 10 inches per year, with 55% falling between October and May (Figure II-4). Seeding of adapted warm season grasses, forbs, and shrubs following burning offers an opportunity for increasing the forage production of this blackbrush site. At present, this site is producing little or no forage as there is a lack of perennial remnant understory grasses.

With the Mt. Tipton allotment under the Santa Rita grazing system, there is ample opportunity for the burning and seeding effort to correspond with the rest phase of the grazing cycle, thus allowing for time for seedling establishment.[61]

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*Black Mountain, Cane Springs, Canyon Ranch, Castle Rock, Cedar Canyon, Ft. McEwen, and Thumb Butte.

h. Riparian Habitat

Cottonwood-willow, acacia, and mesquite bosque communities occur in the spring/riparian areas of the ES area, some of which are of considerable size (see Figure II-13 and Table II- 7 for locations). The soils are more or less moist year round or seasonally saturated, and the native flora is distinct from that in the adjacent Desertscrub and Grassland formations.

Large trees and shrubs include cottonwood (Populus fremontii), coyote, Goodding's and arroyo willows (Salix exigua, S. gooddingii, S. lasiolepis), mesquite, catclaw acacia, seep willow (Baccharis glutinosa), desert willow, and the introduced tamarisk.[62] Sedges (Carex spp.), rushes (Juncus spp.), cattails (Typha domingensis), and grasses are the dominant herbaceous plants. Torrey seepweed (Suaeda torreyana) and sawgrass (Gladium californicum) occur in saline and alkaline areas, respectively.[63,64]

Truxton Wash and Wright's Creek as well as Burns Springs (south end of Ft. McEwen allotment) have well-developed riparian communities.[65] There is a major concentration of active springs along the Colorado River between Hoover Dam and Willow Beach, in the Desertscrub Formation.[66] However, most springs in the ES area lack significant vegetative diversity due to disturbance by animals (cattle, burros) or because they serve as bathtubs if they are inaccessible to animals.[67]

Mountain seeps and springs issue from igneous, metamorphic, and volcanic rocks in the Scrubland and Woodland formations. In such moist, protected areas, hackberry (Celtis reticulata), squawbush (Rhus trilobata), serviceberry (Amelanchier utahensis), coyote willow, sumac (Rhus ovata), pachaba (Brickellia californica), New Mexico locust (Robinia neomexicana), shrub liveoak (Quercus turbinella), and beargrass are notable species.[68]

Hillside and Bushy Springs (on the Canyon Ranch allotment), Lucky Boy Spring (Cerbat allotment), and Grapevine Spring (Crozier Canyon allotment) are examples of springs in the Scrubland and Woodland formations.

Inaccessible (undisturbed) seeps and springs contain a much more delicate flora consisting of such herbaceous species as maidenhair fern (Adiantum capillus-veneris), columbine (Aquilegia chrysantha), helleborine (Epipactis gigantea), climbing milkweeds (Funastrum spp.), and annuals such as sleepy catchfly (Silene antirrhina) and Phacelia laxiflora. Rock-mat (Petriphytum caespitosum) occurs on active travertine seeps.[69] Two relatively inaccessible seeps occur on the ephemeral portion of the Diamond Bar/Gold Basin allotment, near Columbine Falls and in Grapevine Wash. Another such inaccessible spring occurs in the Black Mountains on the Silver Creek allotment.[70]

Plants living directly in the water of springs include stonewort (Chara spp.), naid (Naias spp.), pondweed (Potomogeton spp.), water-cress (Rorrippa nasturtium-aquaticum), water speedwell (Veronica anagallis-aquatica), algae, and other aquatic plants.[71,72,73] These plants serve as principal forage resources for local aquatic invertebrates and tadpoles.

## 6. Animals*

The Cerbat/Black Mountain ES area ranks as one of the most diverse biotic regions in Arizona. Elevations range from 1000 feet on the edge of the Colorado River to 7148 feet above sea level on Mt. Tipton in the Cerbat Mountains. This provides environments suitable for five major vegetation formations, consisting of 23 communities. These communities, in turn, provide specific habitats for 237 native vertebrate species.

The natural flow of desert life within each community is wholly dependent upon delicate interrelationships that occur between every inhabiting organism.[1] Therefore, Cerbat/Black Mountain ES area animals having little or no direct economic significance (small mammals, passeriformes, reptiles, and amphibians) possess inherent ecological qualities which are essential for the zoologic survival of each community. In order to ensure the continued existence of inhabiting species, comprehensive information concerning the region's biotic interrelationships must be derived. Appendix F provides a general description of predator-prey relationships within the ES area's five major vegetation formations.

Unless otherwise noted, quantitative information concerning the present population sizes and trends of ES area carnivores, small mammals, birds, reptiles, amphibians, and invertebrates is unavailable.

### a. Mammals

#### (1) Ungulates

- Desert Bighorn Sheep

Bighorn sheep populations have remained at a relatively stable level within the ES area for the past 20 years. Strict hunting regulations, low predator densities, burro control measures (up to 1971), and domestic sheep grazing restrictions within the region's bighorn habitat have proven effective in curtailing the native sheep's population decline that followed initial settlement of the area by miners and ranchers.

Bighorns occur in two main vegetation formations (Desertscrub and Woodland) on eight allotments (see Figure II-17): Big Ranch, Black Mountain, Ft. McEwen, Diamond Bar/Gold Basin, Gediondia, Portland Spring, Silver Creek, and Thumb Butte. Present range conditions, range trends, bighorn population estimates, and information concerning livestock-bighorn conflicts on these allotments are presented in Table II-18.

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*References for this subsection follow on page II-242.

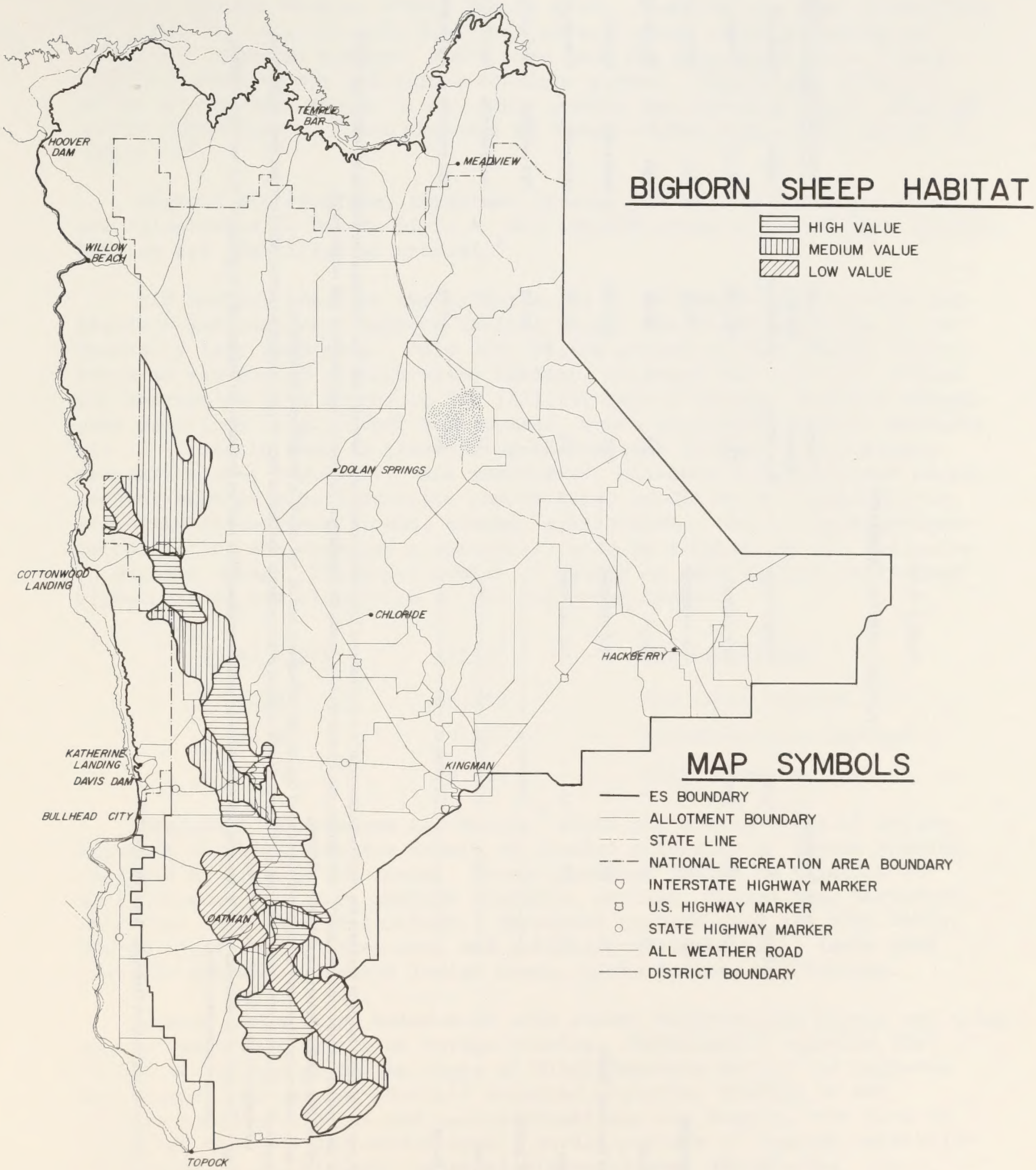


**FIGURE II-17 BIGHORN SHEEP HABITAT**

## TABLE II-18

## BIGHORN HABITAT SUMMARY

| Allotment | Range Condition | | | Range Trend | Present Bighorn Population | Potential Bighorn Population | Livestock-Bighorn Conflict* | |
|---|---|---|---|---|---|---|---|---|
| | Poor | Fair | Good | | | | Degree | Resource |
| Big Ranch | 12% | 76% | 12% | Not available | 247 | 275-290 | Moderate | Forage |
| Black Mountain | 59 | 41 | 0 | Not available | 18 | 20-25 | High | Forage, water |
| Ft. McEwen | 9 | 88 | 3 | Down | 32 | 35-45 | High | Forage, water |
| Diamond Bar/Gold Basin | 29 | 68 | 3 | Not available | 161 | 180-195 | Moderate | Forage |
| Gediondia | 22 | 67 | 11 | Not available | 22 | 25-30 | Moderate | Forage, water |
| Portland Spring | Ephemeral | | | | 11 | 12-15 | Not available | Not available |
| Silver Creek | Ephemeral | | | | 12 | 12-15 | Not available | Not available |
| Thumb Butte | Ephemeral | | | | 13 | 14-18 | Not available | Not available |

*Measurements for wildlife-cattle conflicts are relative values based on professional judgments, which have been derived from comparative analysis of individual AMPs. Criteria used include range condition, species population, species distribution, livestock population, number of water sources, and range trends.

Livestock-wildlife conflict values are defined as follows:

Low – Interactions between cattle and the species of interest are infrequent and do not result in wildlife-cattle conflicts.

Moderate – Forage and/or water resources are limited. Under stressed environmental conditions (lack of rain, prolonged winter, etc.) competition could occur between cattle and the species of interest.

High – The lack of an essential wildlife resource has resulted in serious livestock-wildlife conflict and could be preventing the species of interest from reaching its optimum population size.

**Source:** Cerbat Mountain Unit Resource Analysis, Step 3.

Rugged and secluded terrain of the Black Mountain range provides the primary bighorn habitat within the ES area. Bighorns are also found along the riparian zones of Lake Mead, but these regions serve primarily as temporary watering sources, since they lack the protective cover found within steep canyons and rugged mountain slopes. Migrations of native sheep to seasonal ranges do not occur within the resource areas, although summer temperatures force bighorns to forage within a one-mile radius of water.[2,3]

Bighorn distribution, important lambing grounds, and conflict areas are illustrated in Figure II-18.* All 244,480 acres of the ES area bighorn habitat are identified as crucial.[4]

BLM surveys based on the criteria set up by Hansen[5] and Ferrier and Bradley[6] indicate that bighorn habitat within the Black Mountains is in generally fair condition. Only 31% (76,800 acres) of the present bighorn range is classified as high-value habitat, although the potential exists for increasing this figure to 52% (127,129 acres) through improved management practices (e.g., water development, burro population control measures, etc.). Criteria used in classifying the habitat included: topography (terrain slope, regularity, and rockiness), distance from permanent water, present bighorn use, vegetative composition, condition of forage plants, and human disturbance (roads, mining, subdivisions, etc.). Each environmental factor was assigned a numerical value in relation to its influence on bighorn sheep. The total number of points on each section of ES area bighorn range was classified in the following manner:

| Total Score | Acres[7] | Habitat Status |
|---|---|---|
| 0-50 | 68,480 | Low value habitat |
| 51-79 | 99,200 | Moderate value habitat |
| 80-130 | 76,800 | High value habitat |

McMichael[8] and Hansen and Martin[9] found the annual diets of desert bighorns inhabiting Mohave County to consist primarily of browse species, followed by grasses and forbs. Browse species, listed in relation to their frequency of use, include ocotillo, catclaw, Mormon tea, buckwheat, white bur sage, and brittlebush. Important grasses used are bush muhly, desert fluff grass, three-awn, and galleta grass; the major forbs used are wild buckwheat, desert Indian wheat, globe mallow, and filaree.

Severe competition between ES area desert bighorns and burros may exist due to their high degree of forage overlap. McMichael[10] reported that 50-58% of the plants in the diets of Black Mountain burros and bighorns are shared. Hansen and Martin[11] revealed a similar finding of 46% overlap between bighorns and burros inhabiting the Rampart Cave area of Lake Mead National Recreation Area. During periods of reduced vegetative production (e.g., drought, extended winter season, overgrazing, etc.), burros have demonstrated an unsurpassed ability to adapt and utilize remaining water and forage sources at the expense of native bighorn sheep.[12,13,14]

*Figure II-18 will be found in the "pocket" at the end of this volume.

Cattle and bighorn diets have also been found to overlap considerably within the Desertscrub Formation of Mohave County. Five plants -- desert fluff grass, bush muhly, Mormon tea, globe mallow, and catclaw -- comprised 83% of the annual cattle diet and 87% of the annual bighorn diet near Rampart Cave.[15] This condition demonstrates the high potential for competition between ES area bighorn sheep and domestic livestock within overgrazed allotments.

Although desert bighorn numbers are presently stable within the ES area, the sheep are extremely sensitive to slight changes in the community structure of their native habitat.

- Desert Mule Deer

Desert mule deer are found throughout the Cerbat, Music, Peacock, and southern Black Mountain ranges (see Figure II-18). Population estimates, range conditions, range trends, and information concerning livestock-mule deer interactions on the 25 allotments which support mule deer are presented in Table II-19. The maximum deer population for the entire ES area is presently estimated at 1047 animals.

The ES area's deer population is generally low and is believed to have been declining for more than a decade.[16] Localized exceptions are noted in subsequent paragraphs describing specific mountain ranges. As in most of the western states, deer population declines are believed to be due, in part, to neonatal fawn losses resulting from habitat deterioration through overgrazing by livestock.[17,18]

Mountain lions may have a significant influence on ES area mule deer populations. Hornocker[19] estimated that an adult mountain lion requires 1890-2860 pounds of prey annually. There is little evidence of lions feeding on small mammals, such as rabbits or squirrels.[20] Therefore, each lion will kill approximately 20 deer per year (providing livestock are not available). Reliable lion population estimates for the ES area are unavailable, although 25 animals are known to have been killed in the Cerbat Mountain Planning Unit between 1967 and 1975 (Table II-20).

In regions where deer numbers have been drastically reduced (such as overgrazed allotments in the Music Mountains), lion predation may become an important factor in limiting the deer populations.[21] However, when mule deer have suitable habitat, lion predation is ineffective in significantly reducing deer numbers and serves to strengthen deer populations by eliminating the weak and diseased animals.

Short[22] found that mule deer inhabiting semi-desert ranges (3000-4500 feet) in southern Arizona (with habitat similar to that of the Black and lower Cerbat regions) use desert willow, mesquite, catclaw, fairy duster, ocotillo, eriastrum, spurge, and the fruits of cholla, prickly pear, and

TABLE II-19

MULE DEER HABITAT SUMMARY

| Allotment | Range Condition Poor | Fair | Good | Range Trend | Present Mule Deer Population | Potential Mule Deer Population | Livestock-Mule Deer Conflict Degree | Resource |
|---|---|---|---|---|---|---|---|---|
| Big Ranch | 12% | 76% | 12% | Not available | 28 | 30-35 | Moderate | Forage |
| Black Mountain | 59 | 41 | 0 | Not available | 29 | 30-35 | High | Forage, water |
| Castle Rock | 0 | 100 | 0 | Down | 8 | 10-15 | Moderate | Forage, water |
| Cerbat/Quail Springs/ Turkey Track | 8 | 83 | 9 | Down | 67 | 75-80 | Moderate | Forage, water |
| Dolan Springs | 9 | 82 | 9 | Not available | 32 | 35-40 | Low | Forage |
| Ft. McEwen | 9 | 88 | 3 | Down | 18 | 19-24 | Moderate | Forage, water |
| Mineral Park | 0 | 94 | 6 | Down | 19 | 23-38 | Moderate | Forage, water |
| Mt. Tipton | 65 | 35 | 0 | Not available | 28 | 30-35 | High | Forage |
| Pine Springs | 0 | 57 | 43 | Up | 3 | 5-8 | Low | Forage |
| Stockton Hill | 0 | 56 | 44 | Stable | 9 | 10-15 | Low | Forage, water |
| Canyon Ranch | 20 | 68 | 12 | Not available | 55 | 70-80 | Moderate | Forage, water |
| Diamond Bar/Gold Basin | 29 | 68 | 3 | Not available | 183 | 250-265 | Moderate | Forage |
| Crozier Canyon | Not available | | | | 199 | 210-220 | High | Forage, water |
| Gediondia | 22 | 67 | 11 | Not available | 7 | 7-9 | Moderate | Forage, water |
| Music Mountain | 88 | 12 | 0 | Down | 19 | 25-30 | High | Forage |
| Cane Springs | 31 | 68 | 1 | Down | 109 | 135-145 | Moderate | Forage |
| Cedar Canyon | 6 | 70 | 24 | Stable to up | 43 | 55-68 | Moderate | Forage, water |
| Clay Springs | 6 | 83 | 10 | Stable to up | 24 | 35-40 | Low | Forage |
| Hackberry | 14 | 66 | 20 | Stable | 75 | 80-90 | Low | Forage |
| Mud Springs | 7 | 74 | 19 | Not available | 7 | 7-9 | Moderate | Forage, water |
| Truxton Canyon | 1 | 45 | 54 | Not available | 28 | 30-40 | Moderate | Water |
| Upper Music | 21 | 79 | 0 | Down | 34 | 45-55 | Moderate | Forage |
| Portland Spring | Ephemeral | | | | 4 | 4-6 | Not available | Not available |
| Silver Creek | Ephemeral | | | | 11 | 12-14 | Not available | Not available |
| Thumb Butte | Ephemeral | | | | 7 | 8-10 | Not available | Not available |

**Source:** Cerbat Mountain Unit Resource Analysis, Step 3.

TABLE II-20

ESTIMATED MOUNTAIN LION HARVESTS IN THE CERBAT MOUNTAIN PLANNING UNIT

| Year | Location | Harvest | Year | Location | Harvest |
|---|---|---|---|---|---|
| 1967 | Cerbat Mountains | 1 | 1972 | Cerbat Mountains | 4 |
| | Music Mountains | 2 | | Music Mountains | 10 |
| 1968 | Music Mountains | 2 | 1973 | | 0 |
| 1969 | | 0 | 1974 | Unknown | 1 |
| 1970 | | 0 | 1975 | | 0 |
| 1971 | Music Mountains | 5 | | | |

**Source:** Cerbat Mountain Unit Resource Analysis, Step 3.

barrel cactus as their primary forage sources. At higher elevations (5000-6000 feet), as in the Cerbat and Music mountains, principal mule deer forage consists of cliff rose, mountain mahogany, juniper, pinyon pine, buckbrush, shrub oak, buckwheat, silk tassel, globe mallow, milk vetch, and fleabane.[23,24,25] Forage plants frequently utilized by both the ES area mule deer and domestic livestock include mesquite, catclaw, mountain mahogany, silk tassel, cowania, globe mallow, milk vetch, and shrub oak.

The potential for forage competition between mule deer and cattle has been found to depend largely upon range conditions. For example, on high-quality rangelands, diet overlap between cattle and mule deer is usually less than 7%.[26] However, livestock/mule deer forage overlap may exceed 20% within overgrazed regions.[27]

Mule deer occupy Grassland, Desertscrub, Scrubland, Woodland (pinyon-juniper), and Forest (ponderosa pine) formations within the ES area. Deer use is heaviest in transition zones between open hillsides and stands of pinyon-juniper or chaparral. All mule deer habitat within the Cerbat Mountian Planning Unit is classified as crucial.

Mule deer numbers in the Black Mountains are considered low but stable. A population estimate of only 100 deer has been established for the entire Black Mountain range.[29] Lack of water and preferred forage are believed to be the major reasons for this condition.

Habitat in the Cerbat Mountains is generally fair. This reflects the region's lack of water at higher elevations, which is the principal limiting factor of local mule deer herds.[30] Thick stands of palatable browse species, such as buckbrush, Turbinella, and Garrya, growing at higher elevations of the Cerbat Mountains suggest that with improved management practices (i.e., water development) this area could become an excellent mule deer habitat.

Habitat condition in the Music Mountains is very poor. This is verified by the striking decrease in deer hunting success that has taken place in little more than a decade. Harvest dropped from 225 deer in 1964 to nine deer in 1975.[31] Hawkes[32] found that extreme competition may occur between Music Mountain cattle and mule deer for succulent vegetation (forbs) due to severe habitat deterioration. Investigators feel the stressed environment is a result of constant livestock grazing, combined with more than ten years of low rainfall accumulations and lion predation.[33]

- Pronghorn

Pronghorn inhabit the easternmost extension of the ES area (located on the Crozier Canyon and Hackberry allotments), covering approximately 60 square miles of rolling plains. A small population of pronghorn (8-12 individuals) has also been discovered on the Cedar Canyon allotment within the Hualapai Valley, north of Kingman.[34] Although it is unknown

whether these animals are actually permanent residents of the valley, recent investigations indicate that pronghorn could successfully inhabit the region if livestock grazing pressures were reduced and additional water sources were developed.[35] The Hualapai Valley's potential pronghorn habitat covers 209 square miles (Figure II-18).

The pronghorn herds within the Crozier Canyon and Hackberry allotments have remained at relatively stable populations of approximately 40 and 18 animals, respectively, for several years.[36] The allotments are presently supporting less than one pronghorn per square mile, which is close to the proper density suggested by Hoover et al.[37] for pronghorn on similar ranges in Colorado.

Pronghorn habitat in the ES area falls within the Grassland Formation and consists of mixed shrubs within the grassland communities. Scattered stands of juniper trees occur throughout the region, providing pronghorn with protective fawning grounds and shelter from adverse weather. All present pronghorn habitat is classified as crucial.[38]

Water is believed to be a limiting factor of the ES area pronghorn herds.[39] During periods of low rainfall, water availability for pronghorn is reduced to isolated troughs maintained by local ranchers. In order for pronghorn to achieve optimum utilization of their range, water sources (wells, troughs, water catchments, and reservoirs) should be developed every three to four miles.[40]

Principal pronghorn forage for this species consists of browse, which is found in pronghorn diets throughout the year, and forbs, which are utilized primarily during the late spring and summer months.[41,42] Important browse species include rabbit brush, sagebrush, winter fat, apache plume, and juniper. Forbs frequently used by pronghorn include globe mallow, buckwheat, fleabane, milk vetch, Russian thistle, and aster.

Although grasses rarely comprise more than 1% of the annual pronghorn diet, their utilization is fairly consistent and often increases when young shoots are available. Grasses frequently consumed by pronghorn include wheatgrass, grama, and galleta grass.[43,44,45]

Forage plants consumed by both ES area pronghorn and cattle include wheatgrass, grama, galleta grass, globe mallow, buckwheat, milk vetch, Russian thistle, winter fat, apache plume, and rabbit brush.

The overall condition of the resource area's present pronghorn habitat is poor (see Table II-21). Under good habitat conditions, diet overlap between cattle and pronghorn is negligible.[46] However, low rainfall and year-round livestock grazing have greatly reduced the pronghorn habitat quality. Cattle may rely more heavily upon browse as forage, which may produce competition between domestic livestock and pronghorn.

TABLE II-21

PRONGHORN HABITAT SUMMARY

| Allotment | Range Condition | | | Range Trend | Present Pronghorn Population | Potential Pronghorn Population | Livestock-Pronghorn Conflict | |
|---|---|---|---|---|---|---|---|---|
| | Poor | Fair | Good | | | | Degree | Resource |
| Crozier Canyon | Not available | | | | 40 | 45-55 | High | Forage, water |
| Cedar Canyon | 6% | 70% | 24% | Stable to up | 6 | 6-8 | Not available | Not available |
| Hackberry | 14 | 66 | 20 | Stable | 18 | 20-25 | Low | Forage |

**Source:** Cerbat Mountain Unit Resource Analysis, Step 3.

(2) Carnivores

• Mountain Lions

Mountains lions generally occur in the rougher and more remote parts of the Music and Cerbat mountains, where sufficient cover and game are available. Principal lion habitat falls within the Forest, Woodland, and Scrubland formations on 12 allotments (Big Ranch, CQT, Mineral Park, Mt. Tipton, Canyon Ranch, Crozier Canyon, Music Mountain, Cane Springs, Clay Springs, Hackberry, Truxton Canyon, and Upper Music). Occasional lion occurrences have been noted on allotments within the Peacock and Black Mountain ranges.[47]

The mountain lion is a strict carnivore, feeding almost entirely upon mule deer, cottontail, jackrabbits, and an occasional pronghorn. When such animals are not readily available, lions prey heavily upon domestic livestock. Shaw[48] found that mountain lions in northwestern Arizona consumed 64% mule deer, 32% cattle, and 4% other species (rabbits and pronghorn).

Mountain lions are considered the most destructive predator of livestock within the ES area, particularly in the Music Mountain area where lions were relatively abundant and instances of livestock damage are most common.[49] At present, however, lion populations within the ES area are thought to be declining due to the region's declining mule deer numbers.[50]

• Coyote

The coyote is common throughout all of the ES area allotments. Highest densities occur within Grassland and Desertscrub formations, where small mammals are most abundant.

Coyotes will feed on almost anything available, including plant material and carrion.[51] Meinzer, Ueckert, and Flinders[52] found that fruits from three plants -- mesquite, juniper, and cactus -- made up more than one-third of the annual diet of coyotes inhabiting the Rolling Plains region in Texas. Carrion contributed 6% of the Texas coyote diet, while rodents and rabbits made up 24.5% and 10.5%, respectively, of the annual diet. Insects, birds, snakes, skunks, cattle, mule deer, pronghorn, bird eggs, salamanders, and frogs are also eaten by coyotes.[53,54,55]

Coyotes are able to adapt to a wide variety of range conditions. It is therefore difficult to identify single habitat elements crucial to their survival. ES area livestock grazing appears to have benefited local coyote populations by increasing the abundance of some rodents and jackrabbits (see Small Mammals below).

• Gray Fox

Gray foxes range throughout the ES area with their highest concentrations (two foxes per square mile) occurring in the Scrubland and Woodland formations.[56,57] This species is chiefly nocturnal and utilizes a wide

variety of food resources. Small mammals and carrion comprise approximately 40% of the gray fox's diet, and arthropods and plant material about 28% and 20%, respectively.[58] Birds and reptiles are also eaten, but to a lesser extent.

As with ES area coyotes, gray fox populations have probably benefited from local range management practices, since grazing by livestock promotes plant succession which favors higher densities of small mammal species.

- Bobcat

Bobcats are common within every allotment of the ES area. Their local distribution depends primarily upon rough country and adequate food resources. Areas full of rugged canyons and rocky slopes, intermingled with belts of pinyon-juniper woodlands (such as the Cerbat Mountains), provide the best habitat.[59]

The diet of bobcats consists primarily of cottontails, jackrabbits, and rodents. Birds such as Gambel's quail, mourning doves, and thrashers are also important food sources.

In terms of livestock interaction, local grazing practices have had very little direct influence on bobcats. The terrain most commonly inhabited by ES area bobcats is extremely rugged and often inaccessible to cattle. It is likely that the relatively low intensity of livestock grazing which does occur within bobcat habitat benefits this carnivore by promoting increased densities of rodents.

- Black Bear

Black bear may infrequently occur in the Music and Cottonwood mountains of the ES area. Although verified sightings of bear within the two regions are lacking, tracks believed to be those of black bear have been reported from the Music Mountains.[60] Furthermore, bears are thought to occur on the Hualapai Indian Reservation, which borders the ES region to the northeast.

The Cerbat Mountains area has been listed as one of Arizona's black bear ranges.[61] However, there is no information available supporting the possibility of resident or transient bear inhabitants during recent times.

- Other Carnivores

Additional ES area carnivores include kit foxes, badgers, skunks, and ringtails. Most of these mammals are distributed throughout the ES area and utilize birds, rodents, lizards, and insects as principal forage sources. Information concerning the effects of past and present grazing practices on these predators is unavailable.

(3) Small Mammals. ES area habitats support a diverse variety of small mammals. Forty-one species, including the rare spotted bat, are believed to inhabit the area. A list of small mammals of the impact area is presented in Appendix F.

It is not practical to relate each of the 41 species to specific allotments. Many are distributed throughout the ES area, occupying all 26 allotments. However, some generalizations can be made concerning habitat requirements and the influence of livestock grazing on some principal groups of small mammals.

Squirrels and chipmunks occur throughout all major types of vegetation, but are most common within the Woodland and Scrubland formations. Chief food sources include grass, forbs, acorns, nuts, seeds, and insects. Overall, ES area livestock grazing has probably benefited chipmunk and squirrel populations. Grazing by cattle promotes the growth of annual forbs, shrub oak, juniper, and pinyon pine. Annuals provide abundant succulent vegetation during the spring, while edible seeds are produced by the larger shrubby plants in the fall.

Kangaroo rats and pocket mice live mainly in the Desertscrub and Grassland formations. These small, pouched rodents are most abundant in sandy regions where vegetation is sparse. Their food is comprised largely of forbs, grass, seeds, and some shrub plants. On properly managed ranges, kangaroo rats contribute essential nitrates and nutrients to the soil and aerate the desert substrate.[62,63] However, on depleted ranges, kangaroo rat and pocket mouse densities accelerate in response to the greater abundance of weedy plants. The higher rodent numbers then promote soil erosion.[64,65] This may be the case within overgrazed allotments of the ES area.

Woodrats inhabit all vegetation formations within the ES area. Principal forage sources include cactus, mesquite beans, nuts, acorns, seeds, and fruits. As with chipmunks and squirrels, ES area woodrat populations have probably increased due to local grazing practices.[66] The increased abundance of shrub plants provides additional forage and protective cover for these rodents. This has been documented somewhat by Haskell[67] who found the numbers of dens to be higher on overgrazed rangelands.

Jackrabbits and cottontails are found throughout the ES area, occupying all five vegetation formations. These small mammals are strict herbivores and consume significant quantities of grasses, forbs, and shrubby growth. For instance, 148 black-tailed jackrabbits consume as much forage as one cow.[68] ES area livestock grazing practices may promote high jackrabbit populations. Arnold[69] found that excessive livestock grazing is primarily responsible for increased jackrabbit numbers on Arizona rangelands.

White-footed mice are the most abundant and widespread mammals within the ES area. These rodents inhabit all vegetation formations and utilize a wide variety of food sources, including seeds, insects, berries, green vegetation, nuts, and acorns. The impact of past and present livestock grazing within the ES area on white-footed mice populations is probably insignificant since they are abundant on both overgrazed and high-quality ranges.

Bats are common throughout all vegetation formations of the ES area. These highly specialized flying mammals feed almost exclusively on insects. Their principal habitat is near riparian areas and water troughs where insect densities are high. Bats may be as essential in controlling insect populations as insectivorous birds,[70] since many night-flying insects are preyed upon almost exclusively by the region's bat species. The influence of ES area livestock grazing practices of bat populations is unknown. However, the construction of water troughs and earthen reservoirs by local ranchers has provided additional highly productive feeding grounds for ES area bat species.

b. Wild Horses and Burros

The ES area supports approximately 12 wild horses and an estimated burro population of 1825. Historically, the burro and wild horse provided aboriginal Americans with transportation and food. Today, however, uncontrolled equine populations are exploiting habitats at the expense of native wildlife.[71,72] Present ES area wild horse and burro distribution are shown in Figure II-18.

- Wild Horses

Approximately 12 wild horses inhabit the southern reaches of the Cerbat Mountain range, within the Mineral Park and Canyon Ranch allotments. The animals are a remnant population that once consisted of nearly 1000 horses and ranged throughout the Hualapai Mountains, Cerbat Mountains, Hualapai Valley, and Grand Wash Cliffs.[73] It is believed the wild horses are of at least partial Spanish origin, since early documents mention the presence of horses within the ES area long before domestic livestock were introduced.[74]

The Cerbat Mountains wild horse range includes four major vegetation formations: Woodland, Scrubland, Desertscrub, and Grassland. Wild horses live in each formation throughout the year and appear to be least abundant in the Grassland regions.[75]

Important wild horse forage within the Cerbat range includes sedges, blue grass, desert needlegrass, needle and thread grass, three-awn, wheatgrass, dropseed, grama, bush muhly, winter fat, Russian thistle, and saltbush.[76,77,78]

The number of wild horses appears to be relatively stable in the Cerbat planning unit.

The mountain lion is the only predator of the ES area wild horses.[79] Information concerning the predator-prey relationship of these two animals within the area is presently lacking.

There are no known conflicts between wild horses and mule deer. More than 97% of the forage consumed by mule deer consists of shrubs, forbs, trees, and cacti, while the diet of wild horses is composed primarily (more than 85%) of grasses.[80,81] Furthermore, Hubbard and Hansen[82] state that grazing by wild horses may promote plant succession which favors increased production of deer forage.

Table II-22 shows present range conditions and trends, wild horse population estimates, and information concerning livestock-wild horse conflicts for the Mineral Park and Canyon Ranch allotments.

Competition between the region's wild horses and cattle is negligible. The horse range is located within some of the most rugged topography of the Cerbat Mountains, which limits the intensity of livestock grazing.

- Burros

Burros are very successful within the ES area, being found throughout most of the Black Mountain Planning Unit. They have the ability to increase in population size and exploit habitat resources in a manner unparalleled by native ungulates. Woodward and Ohmart[83] found that burros of the Chemehuevi Mountains in California (approximately five miles southwest of the ES area) consume 39 species of plants and increase their population by 20-25% every 13-18 months.

In the ES area burros occur in two major vegetation formations (Desertscrub and Woodland) on seven allotments: Big Ranch, Black Mountain, Ft. McEwen, Gediondia, Portland Spring, Silver Creek, and Thumb Butte. Table II-23 provides information concerning forage production levels and burro-livestock forage consumption rates on ES area burro habitat. As noted above, there are about 1825 burros in the ES area.

Principal burro forage of the Cerbat/Black Mountain ES area (listed in relation to annual frequency of utilization) includes bush muhly, paloverde, three-awn, desert fluff grass, common reed, ocotillo, globe mallow, brittlebush, red brome, cholla, prickly pear, wild buckwheat, Anderson wolfberry, Mormon tea, galleta grass, Indian wheat, bur sage, and mesquite.[84,85]

Forage plants utilized by both ES area burros and cattle include bush muhly, desert fluff grass, globe mallow, red brome, wild buckwheat, Mormon tea, galleta grass, Indian wheat, bur sage, and mesquite. This high degree of forage overlap may promote severe livestock-burro competition on ES area allotments within the Black Mountains if present grazing practices and burro management programs (or lack thereof) are continued.

Burro habitat destruction through damage to native vegetation and fouling of regional water supplies is also exerting an increasingly detrimental effect on Black Mountain bighorn sheep, as noted above. For example, McMichael[86] found that overlapping diets and summer ranges of these sheep and burros may be preventing the native sheep from achieving their maximum population densities.

c. Birds

Birds are well represented in the ES region where 513 species, including the endangered bald eagle and peregrine falcon, are known to occasionally occur. The prairie falcon, golden eagle, seven owl species, and 11 species of hawks can also be found within the ES area. Important resident game

## TABLE II-22

### WILD HORSE HABITAT SUMMARY

| Allotment | Range Condition: Poor | Range Condition: Fair | Range Condition: Good | Range Trend | Present Wild Horse Population | Potential Wild Horse Population | Livestock-Wild Horse Conflict: Degree | Livestock-Wild Horse Conflict: Resource |
|---|---|---|---|---|---|---|---|---|
| Cerbat/Quail Springs/ Turkey Track | 8% | 83% | 9% | Down | 0 | 2 | Low | Forage, water |
| Mineral Park | 0 | 94 | 6 | Down | 5 | 6 | Low | Forage |
| Canyon Ranch | 20 | 68 | 12 | Not available | 7 | 6 | Low | Forage, water |

Source: Cerbat Mountain Unit Resource Analysis, Step 3.

## TABLE II-23

### CERBAT/BLACK MOUNTAIN ES AREA BURRO RESOURCE SUMMARY

| **Forage Production** | | **Forage Consumption** | |
|---|---|---|---|
| Desertscrub Formation | 496,000 acres | Burro Population | 1,825 |
| Desertscrub Forage Production | 43 lb/acre/yr | Burro Forage Consumption | 3,285 lb/yr |
| Total Production | 21,328,000 lb/yr | Total Consumption | 5,995,125 lb/yr |
| **Woodland Formation** | 29,440 acres | Minimum Number of Cattle Grazing (yearlong) within Burro Habitat | 1,440 |
| Woodland Forage Production | 123 lb/acre/yr | Domestic Stock Forage Consumption | 7,300 lb/yr |
| **Total Production** | 3,621,120 lb/yr | Total Consumption | 10,512,000 lb/yr |
| Total Forage Production on Burro Habitat | 24,949,120 lb/yr | Total Forage Consumption on Burro Habitat | 16,507,125 lb/yr |

birds include mourning doves, white-winged doves, and Gambel's quail. Migratory birds are occasionally observed resting on reservoirs and irrigated fields in the Hualapai Valley and Colorado River during their spring and fall migrations.[87]

(1) Upland Game Birds. Gambel's quail are found throughout all allotments of the ES area. Their optimum habitat consists of major wash systems and adjacent foothills within Desertscrub and Scrubland formations.

The diet of quail consists largely of seeds from forbs, shrubs, and grasses. When available, Gambel's quail also show a high preference for filaree.[88]

The seasonal quantities of green herbage appear to be a principal factor in regulating southwestern quail populations.[89] Gambel's quail population sizes have been directly correlated to winter rainfall accumulations.[90,91] Furthermore, Hungerford[92] found that following winters of heavy precipitation, the resulting spring growths of green vegetation provide Gambel's quail with additional sources of vitamin A, resulting in higher rates of reproductive success.

Quantitative information on the effects of livestock grazing on ES area quail population is unavailable. However, overgrazing by livestock on ES area allotments, particularly near springs, has reduced the availability of protective cover and forage plants utilized by quail.[93]

Mourning doves are common breeding birds of the ES area from early spring to late fall. During winter months they often migrate to lower regions of Mohave County, such as riparian zones along the Colorado and Big Sandy rivers. Desert washes, bordered with large stands of catclaw and cholla, provide optimum mourning dove habitat. Maximum summer utilization of such regions depends on adequate food sources and on water being available within a five-mile radius of the area.[94]

The diet of mourning doves includes cholla and prickly pear fruits, galleta grass, desert willow, ocotillo, prickle-poppy, legumes, and Indian rice grass,

White-winged doves are rare summer inhabitants of the ES area. They migrate from Mexico during the early spring and occasionally nest within the Desertscrub Formation on ES area allotments. White-winged dove forage resources and water requirements are similar to those of mourning doves. Nesting sites are usually located within thick stands of salt cedar and mesquite.

The effects of ES area livestock grazing on dove population is unknown. In other areas, overgrazing by cattle has been found to reduce dove forage resources and protective cover.[95] The development of water troughs and earthen reservoirs by ES area ranchers has benefited local dove population and probably enabled the birds to extend their summer ranges.

(2) Raptors. Twenty-two species of raptors are believed to inhabit the ES area. Different species of hawks, owls, falcons, and eagles can be found throughout all 26 allotments depending on the season, terrain, and availability of prey. Relatively little is known about the status of individual species within the ES area.

Important raptor nesting sites within the ES area include the Grand Wash Cliffs, large cottonwood trees located near many permanent springs, and steep rock formations throughout the Cerbat and Black mountains. Information concerning habitat requirements and specific nesting sites for ES area raptor species is presented in Appendix F.

Most of the raptors feed on rodents, cottontails, jackrabbits, doves, quail, and smaller nongame birds. Larger predatory birds, such as golden eagles, red-tailed hawks, swainson's hawks, ferruginous hawks, and rough-legged hawks, feed heavily on jackrabbits and cottontails. The diets of owls, falcons, and smaller hawks consist largely of rodents. perching birds, and insects. Existing raptor food resources within the ES area appear to be in good condition.[96]

The effect of present livestock grazing practices on local raptor populations is mixed. Cattle grazing tends to increase rodent and jackrabbit densities. However, dove, quail, and perching birds habitat is altered by heavy livestock grazing which results in reduced bird carrying capacities on rangelands. Furthermore, riparian vegetation surrounding livestock watering sources is often severely damaged by the concentrated grazing and trampling activities of cattle. This reduces protective cover and destroys young trees which are essential for the reproductive success of some nesting raptor species. Overall, livestock grazing within the ES area may have slightly reduced the quality and quantity of local raptor habitat.

(3) Aquatic. Waterfowl utilization of the ES area is very limited. Ducks, geese, and shorebirds are occasionally sighted on small reservoirs and on Red Lake following periods of heavy rainfall. These uncommon inhabitants are transient birds which use the small bodies of water as temporary resting sites during their long migrations.

The Colorado River, adjacent to the ES area, is not located beneath a major avian flyway. Therefore, small flocks of transient waterfowl are the region's principal inhabitants. Present livestock practices have little or no effect on these precious creatures.

A list of waterfowl believed to migrate through the ES area is presented in Appendix F.

(4) Other Nongame Birds. Nongame bird communities of the ES area are characterized by high species diversity, rather than by large numbers of individual birds. These small birds are found throughout all 26 allotments, with different species inhabiting virtually every vegetation

community within the ES area. A complete list of nongame birds and a summary of their habitat requirements is presented in Appendix F. Additional bird species which have not been officially recorded may also inhabit the region.

The diets of nongame (perching) birds encompass nearly all sources of desert productivity. However, the majority of local bird species use various forms of seeds, fruits, and insects.

Information concerning the effects of local grazing on nongame birds is lacking.

d. Amphibians

Amphibians comprise the smallest class of vertebrate inhabitants within the ES area. Two species of frogs, one salamander, and four toad species are known to occur. This low species diversity is due to lack of adequate habitat. Most amphibians are found near springs and stock ponds throughout all ES area allotments.

Quantitative information on the effects of present livestock grazing practices on amphibian populations is lacking. However, evidence of amphibian habitat deterioration is prevalent throughout the ES area. Cattle have fouled water supplies and severely damaged essential riparian vegetation through concentrated grazing and trampling activities near springs. Burros and wild horses also contribute significantly to the alteration of amphibian habitat through actions similar to those of livestock. In contrast, numerous developments of water troughs and earthen reservoirs by ES area ranchers have provided native amphibians with additional habitat. The effect on amphibians in the ES area is unknown.

e. Reptiles

In contrast to the ES area's low amphibian diversity, a wide variety of reptile species are known to occur. The threatened (state list) desert tortoise, 21 species of snakes, and 17 lizard species, including the threatened (state list) Gila monster, can be found within the region. A few of these species are very sensitive to the vegetative alterations that livestock grazing has initiated within the ES area, while most species seem to have adapted to the influence of past and present grazing practices.

Reptiles which are uncommon within the ES area and appear to be vulnerable to livestock grazing include the following: desert tortoise, Gila monster, Arizona night lizard, Great Plains skink, and rosy boa.

Reptiles are distributed throughout the ES area with many species occuring in virtually every allotment and vegetation formation. Major habitat requirements for reptile species of the Cerbat/Black Mountain region are summarized in Appendix F.

f. Invertebrates

ES area rangelands abound with numerous species of insects, crustaceans, microorganisms, and other invertebrates. These creatures possess inherent ecological roles which directly influence the productivity of grazing land

and wildlife habitat within each allotment. Some species are essential for the pollination of plants. Others, such as ants, grasshoppers, and caterpillars, consume significant amounts of desert herbage, thus competing with livestock and a majority of local wildlife species. Many invertebrates are important food for lizards, frogs, birds, rodents, bats, and foxes. Other forms, which occur in association with soils, decompose organic materials to detritus, thereby returning nutrients to the soil. A list of invertebrates which inhabit the ES area is presented in Appendix F.

g. Threatened and Endangered Species

A list of threatened and endangered wildlife species of the Cerbat/ Black Mountain ES area is presented in Table II-24. The list includes eight vertebrate species whose presence is confirmed or possible.

The peregrine falcon is believed to be a rare summer inhabitant of the ES area.[97] Although Mohave County is located within the raptor's historic breeding range, no confirmed regional breeding records exist. Over the past 30 years, peregrine numbers have declined dramatically throughout North America.[98] Estimates of peregrine falcon densities in the Southwest have been placed at less than one pair per 5000 square miles.[99]

The primary reason for diminishing peregrine numbers is occurrence of high concentrations of chlorinated hydrocarbon pesticide residues within the falcon's body tissues. Grazing activities have little or no direct effect on the well-being of this species within the ES area.

The snowy egret and the great egret occasionally inhabit tule marshes and ponds along the ES area's Colorado River riparian zone during their spring and fall migrations. Sprunt[100] states that plume hunters nearly annihilated these two birds during the early 1900s for their white back feathers; the feathers are reported to have sold for $32 per ounce. Although measures to protect snowy and great egret populations have resulted in significant population increases through much of the United States, Arizona's numbers of the two birds remain dangerously low. This is due to increased habitat alterations along central Arizona rivers and streams. ES area livestock grazing has no known impact on either birds.

The endangered southern bald eagle is a probable yearlong resident of high cliffs along the Colorado River, adjacent to the ES area.[101]

Bald eagles are generally decreasing in numbers throughout North America. Causes of the decline include habitat destruction and reduced reproductive success from the ingestion of pesticide-contaminated prey.

The effects of local grazing practices on southern bald eagle habitat are unknown, but probably insignificant since fish and waterfowl comprise the raptor's principal prey resources.

## TABLE II-24

### THREATENED AND ENDANGERED WILDLIFE OF THE CERBAT/BLACK MOUNTAIN ES AREA

| Common Name | Scientific Name | Status* | |
|---|---|---|---|
| Birds | | | |
| Great Egret | *Casmerodius albus egretta* | S | Group III |
| Peregrine Falcon | *Falco peregrinus anatum* | F, S | Group II |
| Snowy Egret | *Leucophoyx thula brewsteri* | S | Group III |
| Southern Bald Eagle | *Haliaeetus l. leucocephalus* | F, S | Group II |
| Zone-tailed Hawk | *Buteo albonotatus* | S | Group III |
| Reptiles | | | |
| Desert Rosy Boa | *Lichanura trivirgata gracia* | S | Group IV |
| Desert Tortoise | *Gopherus agassizi* | S | Group III |
| Gila Monster | *Heloderma suspectum* | S | Group III |

*Status: F = Occurs on Federal Endangered or Threatened list.
S = Occurs on Arizona Threatened Wildlife list.
Group II = Endangered – Species or subspecies in danger of being eliminated.
Group III = Threatened – Species or subspecies whose status may be in jeopardy in the foreseeable future.
Group IV = Species or subspecies sufficiently limited in distribution in Arizona that a major ecological disturbance could jeopardize their existence in this state.

**Sources:** Museum of Northern Arizona; Bureau of Land Management data.

The zone-tailed hawk is uncommon but native to the ES area's 26 allotments. Principal habitat falls within the Desertscrub Formation, usually near riparian or semi-riparian areas. The reason for this raptor's gradual statewide population decline has not been sufficiently defined. Possible explanations include riparian habitat damage through overgrazing and trampling by livestock and deteriorated prey resources by overgrazed rangelands.

The diet of zone-tailed hawks consists primarily of small mammals, lizards, frogs, perching birds, and upland game birds.

Information concerning the status of zone-tailed hawks on ES area allotments is unavailable.

Desert rosy boas inhabit the extreme southwestern portion of the ES area, located within the Silver Creek and Black Mountain allotments. The habitat of the rosy boa consists of rock desert regions, often near permanent water. The boa is chiefly nocturnal and feeds primarily on rodents and small birds.[102]

The Arizona distribution of this subspecies is very limited. State wildlife authorities believe the desert rosy boa could become threatened in Arizona if a major ecological disturbance occurred within the snake's habitat.[103]

The degree of rosy boa habitat disturbance from ES area grazing practices cannot be accurately stated. However, excessive livestock grazing is believed to deteriorate this snake's habitat quality by reducing protective cover and by decreasing the abundance of prey.

The desert tortoise inhabits washes, dunes, and occasionally rocky slopes throughout the ES area's Desertscurb and Grassland formations. All 26 allotments are located on desert tortoise habitat.

Desert tortoise populations have diminished throughout the ES area over the past 30 years. Coombs[104] found that tortoise populations in the extreme southwestern corner of Utah (directly adjacent to northern Mohave County) have declined from an estimated density of 25 tortoises per square mile before 1936 to less than five per square mile by 1974. The decline of desert tortoise populations throughout its natural range has been attributed, in part, to habitat destruction from livestock grazing.[105]

The diet of the desert tortoise consists primarily of red brome, filaree, prickly pear flowers and fruits, Indian rice grass, buckwheat, desert fluffgrass, and bush muhly.

Severe competition may exist between ES area cattle and desert tortoise populations due to their great overlap in forage requirements. On overgrazed ranges, tortoise carrying capacities may become reduced to the point that death rates exceed reproduction, resulting in localized extinction of the species.

The Gila monster is a rare inhabitant of lower mountains and slopes, alluvial fans, and canyon bottoms throughout the ES area's Desertscrub and Scrubland formations. All 26 allotments are located on Gila monster habitat.

The influence of present livestock grazing practices on ES area Gila monster populations is uncertain. Preliminary evidence suggests that overgrazing by livestock may be partially responsible for this species' threatened status, through the deterioration of protective vegetation cover and through the reduction of small birds and reptile prey resources.

h. Riparian Habitat

In the ES area, water from isolated springs often stands between successful wildlife populations and localized extinction, especially during June and July. During these months, precipitation is extremely sparse, succulent range forage disappears and temperatures often exceed 100°F. The microhabitats surrounding permanent springs provide aquatic and terrestrial wildlife with water, succulent vegetation, shade, breeding sites, food, and cover.

From previous studies, it has been determined that per unit area, southwestern riparian habitats are more productive in terms of total wildlife values than any other North American habitat type.[106]

Invertebrates which inhabit ES area springs include water boatmen, water scavenger beetles, aquatic snails, and tadpole shrimp. Appendix F provides information on specific habitat requirements of local aquatic invertebrates.

Although ES area toad species often utilize temporary rain pools and earthen reservoirs as their only sources of standing water, leopard and tree frogs must rely more heavily on permanent springs. ES area riparian environments provide the two frog species with an abundance of moths, mosquito larvae, flies, and beetles, protective cover, and permanent aquatic environment which promotes higher levels of reproductive success.

A number of reptiles, particularly rattlesnakes, racers, king snakes, and garter snakes, are common inhabitants of riparian areas. By concealing themselves with dense vegetation, they prey heavily upon frogs, toads, insects, small birds, and rodents which inhabit riparian areas or frequent such regions for the purposes of watering and foraging.

Mule deer, bighorn sheep, pronghorns, and wild horses and burros often concentrate near springs following watering activities in order to utilize thick growths of riparian forage plants (mesquite, shrub live oak, love grass, bluegrass, rabbit-foot grass, etc.) and to seek shelter from the heat under hackberry and cottonwood trees.

Large riparian trees also provide raptors and perching birds with safe nesting sites. The zone-tailed hawk, marsh hawk, rough-legged hawk, ladder-backed woodpecker, ash-throated flycatcher, white-winged dove, and house finch commonfly raise their young in riparian shrubs and trees. Seeds and fruits from various grasses, shrub live oak, squawbush, and hackberry trees provide riparian perching birds with adequate food sources, while raptors prey upon the relatively high densities of riparian frogs, toads, small birds, rodents, and snakes.

7. Land Use*

a. General Land Use Characteristics of the County and Study Area

(1) Ownership and Use Patterns. Land use and the related public regulation of land reflect the pervasive influence of Federal ownership within the state. Forty-five percent of all land in the State of Arizona is owned by the Federal Government, with another 27% held in trust as Indian reservations. Federal ownership is even more dramatically evident in Mohave County where 67% of land is so owned, 7% is in Indian reservation, and only 5% is state owned. Twenty-one percent, or 1,782,060 acres, is in private ownership, subject to local control and property taxation, as shown in Table II-25. Private ownership as a percentage of total land in the ES area, however, is slightly larger -- 32%, or 819,994 of the 2,526,221 acres.

The Cerbat/Black Mountain Planning Area acreage is approximately 30% of the entire county. As indicated in Figure II-19,** the major landowners in the study area are the BLM, with 47% (1,193,797 acres) of the area's acreage, and individual or corporate owners, with 32%. The major public open space use is the Grand Canyon National Park and Lake Mead National Recreation Area. The acres by use for Mohave County are shown in Table II-26; the land use patterns are shown in Figure II-20, and the zoning designations are shown in Figure II-21.

The historic ownership and disposition of public lands*** have resulted in a checkerboard pattern of land ownership. Large tracts of public land are interspersed with private and state-owned lands (Figure II-19). A primary control in land use designations within the study area is the Federal Land Policy and Management Act of 1976. Under this act, BLM evaluates its properties within the study area so as to determine which lands are suitable for multiple-use management and which are suitable for sale or exchange with other public or private owners. Most of the BLM properties have been classified for multiple-use management, which assumes the likelihood of compatible and coexisting activities within single parcels of BLM-owned properties. Although the primary activity in most of these properties is grazing, other activities include wildlife preservation, recreational facility provision, watershed protection, and, in certain situations, mining.

Within the study area, "urban" areas are defined by BLM as communities with a population of 5000 or more and "suburban" areas as those with a population concentration of less than 5000. The only identified urban area in the county is Kingman and environs with a population of approximately 13,396 as of 1974. The following five areas have been designated as suburban:

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*References for this subsection follow on page II-248.

**Figure II-19 will be found in the "pocket" at the end of this volume.

***Railroad land grants and subsequent sales, Spanish land grants, the Homestead Act, and the Arizona Statehood Grant.

TABLE II-25

LAND OWNERSHIP AND ACRES - MOHAVE COUNTY AND ES STUDY AREA

| Owner | Mohave County Percent | Mohave County Acres | ES Study Area Percent | ES Study Area Acres |
|---|---|---|---|---|
| Bureau of Land Management | 51% | 4,327,860 | 47% | 1,193,797 |
| Grand Canyon National Park and Lake Mead National Recreation Area | 16 | 1,357,760 | 16 | 407,095 |
| Indian Reservations | 7 | 594,020 | >1 | 800 |
| State of Arizona | 5 | 424,300 | 4 | 104,535 |
| Individual or Corporate | 21 | 1,782,060 | 32 | 819,994 |
| Total | 100% | 8,486,000 | 100% | 2,526,221 |

Source: Bureau of Land Management.

TABLE II-26

ACRES BY USE, MOHAVE COUNTY - 1975

| | Acres | Parcels |
|---|---|---|
| Residential | 419,800 | 181,031 |
| Commercial | 2,117 | 3,031 |
| Industrial | 3,400 | 14 |
| Farm Property | 3,223 | 38 |
| Ranch Property | 917,440 | 1,122 |
| Utilities | | |
| Railroad Operator Property | 77,433 | 13 |
| Telephone and Telegraph | 146 | 61 |
| Pipeline Operator Property | 5,522 | 39 |
| Gas and Electric Operator Property | 472 | 72 |
| Water Operator Property | 391 | 32 |
| TV System and Microwave | 2.5 | 4 |
| Producing Mines | 10,718 | 7 |
| Nonproducing Mines | 10,307 | 246 |
| Undeveloped Rural | 295,465 | 5,598 |
| Undeveloped Rural with Miscellaneous Investments | 8,069 | 146 |
| Total | 1,754,506* | 191,454 |

*Difference between this total and total private land shown in Table II-25 is assumed to be a reflection of tax-exempt properties.

Source: Mohave County Assessment Rolls.

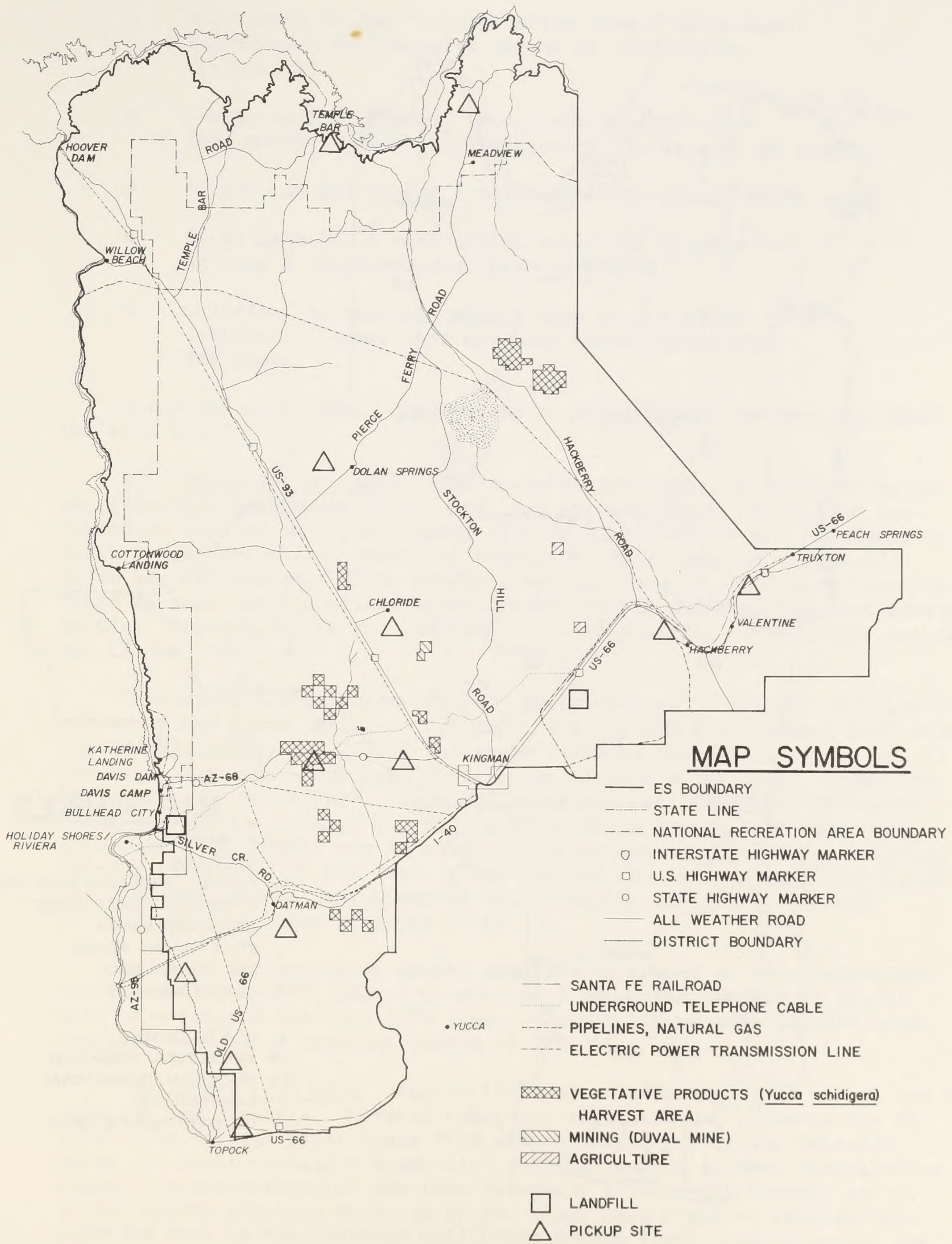


**FIGURE II-20 GENERALIZED LAND USE MAP**

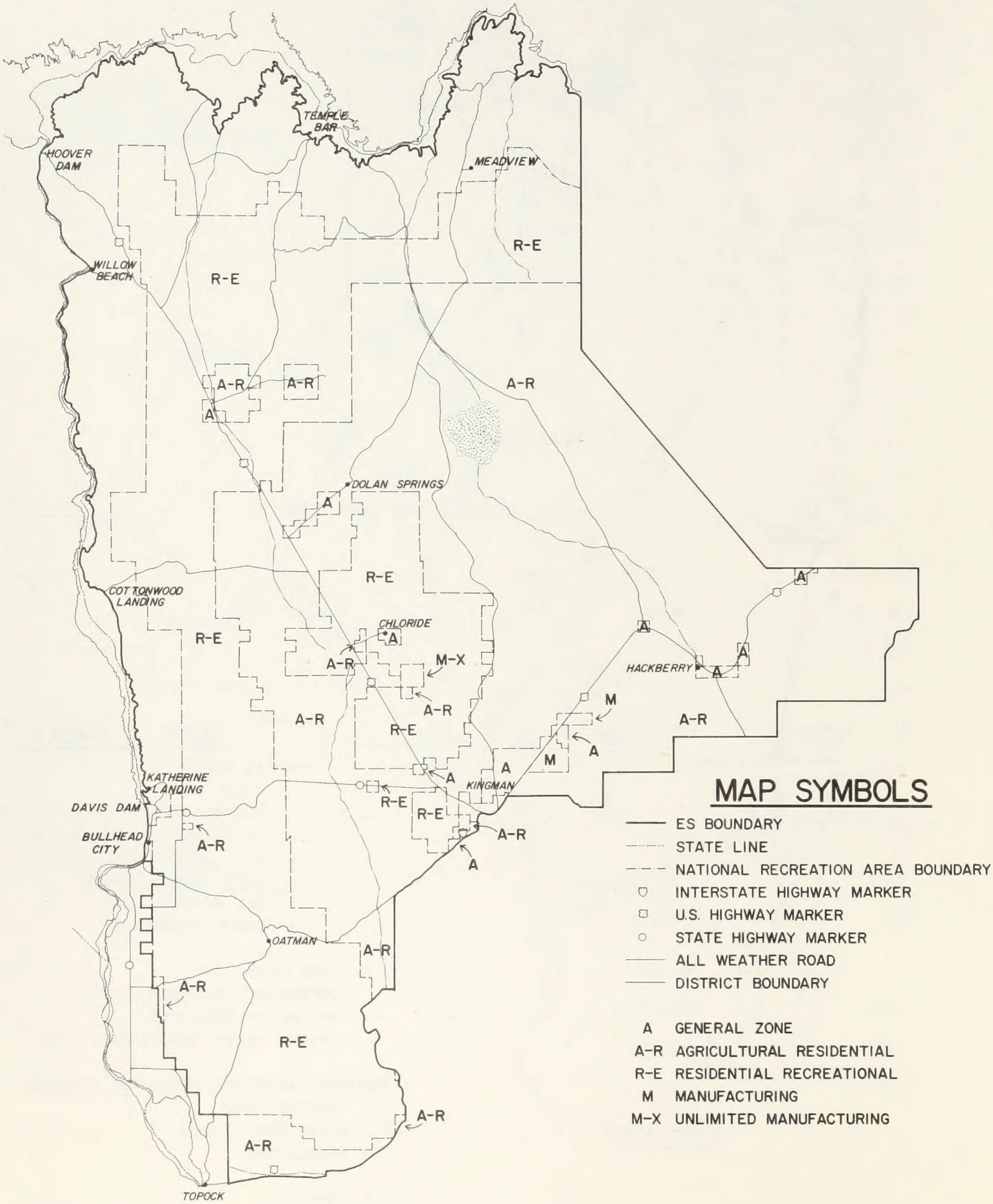


**FIGURE II-21 ZONING MAP**

- Sacramento or the "Golden Valley area," which has experienced an intensive amount of subdivision speculation.

- Yucca, on U.S. Highway 66 and the location of a Ford Motor Company proving grounds (outside of ES area).

- Oatman, an old mining town of historic significance.

- So-Hi Estates, a residential suburb of Kingman containing a few commercial establishments.

- Chloride, another old mining town with a small residential area, that has been slowly dying over the years.

These and other small communities in the area are further described in Table II-27.

(2) Uncontrolled Lands. The uncontrolled lands, as referred to in the allotment management plans, are, for the most part, rural land subdivisions located on private lands (Figure II-22) within the allotment or ranch boundaries but on which the rancher holds no grazing lease and which are not fenced. These subdivisions are largely to totally inactive. There is some minor conflict between occupied but unfenced lots and grazing cattle. However, it is the landowner's responsibility to fence the cattle out if desired.

"Arizona's Remote Subdivisions: An Inventory," a January 1975 publication of the State Office of Economic Planning and Development, indicates that Mohave County has 28% of the state's remote subdivided acres, 24% of the lots, and an average subdivision size of 1422 acres (size ranges from 10 acres to 12,800 acres). Subdivisions represent 20% of all privately-owned land in the county, but only 6.5% of these remote lots house any structure. The county has 56 subdivisions of 640 or more acres, totaling 234,857 acres and 150,044 lots. When smaller and more urban subdivisions are included, these figures expand to 186 units, 264,515 acres, and 179,475 lots, as shown in Table II-28.

In terms of population growth compared to number of lots subdivided between 1960 and 1970, Mohave County had a population growth of 18,121 with an estimated need for 6259 lots. However, there were 127,017 lots created, leaving an apparent excess of 120,758.

(3) Other Land Uses. Figure II-20 also indicates major lineal use -- existing and proposed. Several bulk-type rights-of-way traverse the ES area: high-voltage power lines from generator sources on the Colorado River and lower-voltage transmission systems leading to user distribution lines; a transcontinental American Telephone & Telegraph Company cable; a coal slurry pipeline operated by the Black Mesa Pipeline Company that provides fuel to the Southern California Edison Power Company across the

TABLE II-27

COMMUNITIES IN THE ES AREA

| | 1970 Census | 1974 Census | Internal Growth 1970-1974 | Share of Total County 1974 Population |
|---|---|---|---|---|
| Kingman Area | 10,540 | 13,396 | 27.0% | 37.5% |
| City of Kingman | 7,312 | 7,202 | -1.5% | 20.2% |
| Mohave Valley | | | | |
| Upper Mohave Valley | 3,759 | 5,668 | 50.0 | 15.9 |
| Bullhead City | | 746 | | |
| Holiday Shores/Riviera* | | 4,801 | | |
| Davis Camp | | 121 | | |
| Lower Mohave Valley | 1,591 | 2,011 | 26.3 | 5.6 |
| Yucca* | | N.A. | | |
| Oatman | | 84 | | |
| Topock* | | 159 | | |
| Willow Valley Area* | | 828 | | |
| Surrounding Kingman Area | 2,020 | 2,363 | | |
| Sacramento Valley | 574 | 619 | 7.8 | 1.7 |
| Chloride | 261 | 151 | -42.1 | 0.4 |
| Dolan Springs | 354 | 504 | 42.3 | 1.4 |
| Meadview | 204 | 329 | 61.2 | 0.9 |
| Hackberry | N.A. | N.A. | - | - |
| Valentine/Peach Springs/Truxton | 627 | 760 | 21.0 | 2.1 |
| County Total | 28,857 | 35,714 | 38.0% | 100.0% |

N.A. = Not available.

*Outside of ES area.

Source: Mohave County Planning and Zoning Commission, Mohave County 1974 Special Census, March 1975.

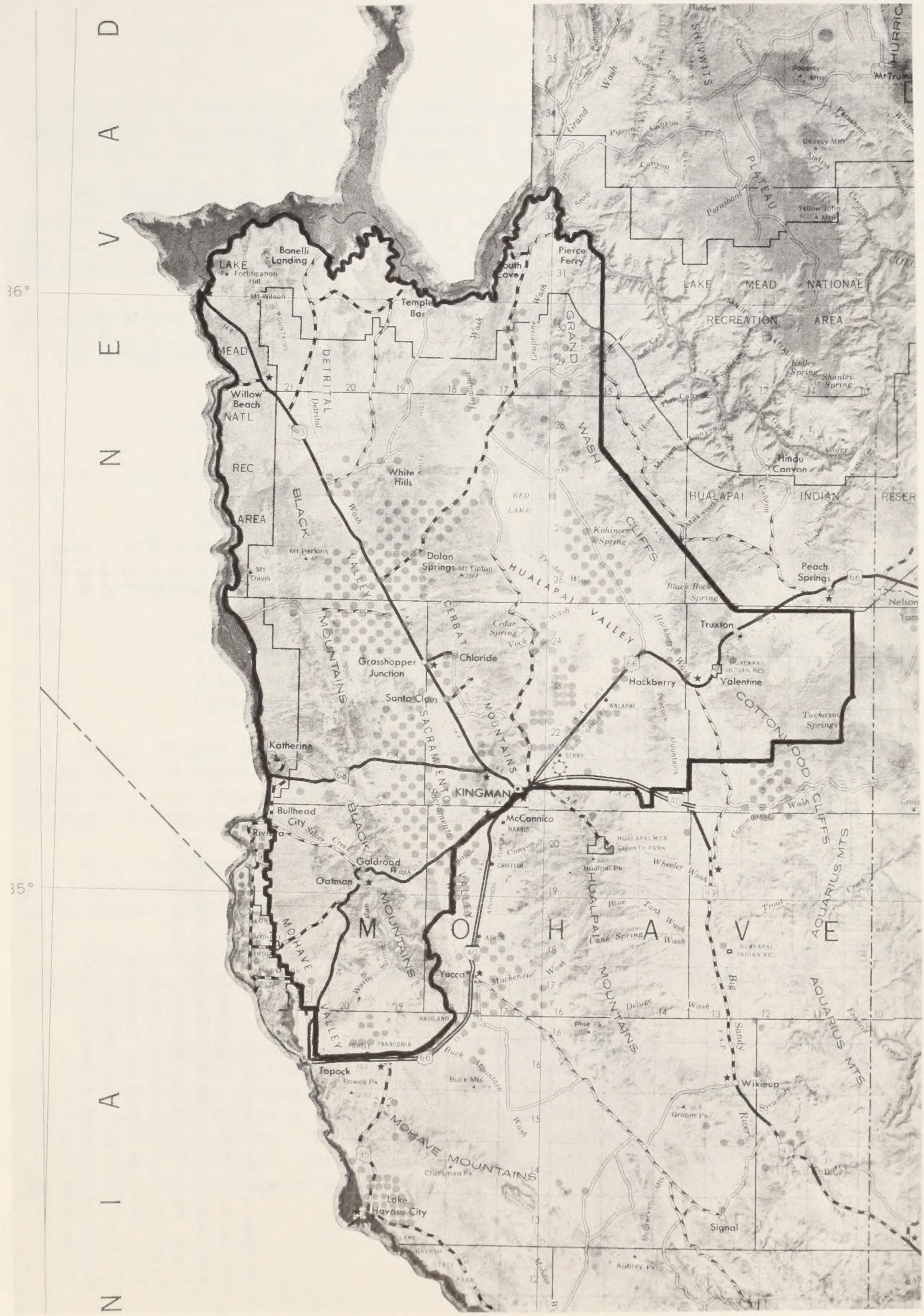

FIGURE II-22 LOCATION OF REMOTE SUBDIVISIONS

TABLE II-28

REMOTE RESIDENTIAL SUBDIVISIONS - 1975

| | Number of Subdivisions | Number of Subdivision Lots | Number of Acres | Number of Lots |
|---|---|---|---|---|
| Mohave County | 186 | 534 | 264,515 | 179,475 |
| Subdivision of +640 Acres | 56 | | 234,857 | 150,044 |
| Subdivision of +50 Lots | 149 | | 247,328 | 179,535 |

Source: Arizona Office of Economic Planning and Development, "Arizona's Remote Subdivisions: An Inventory," January 1975.

TABLE II-29

RIGHT-OF-WAY MILEAGE - MOHAVE COUNTY AND BLM LANDS

| | Total Miles | Miles on BLM Land | Percent on BLM Land |
|---|---|---|---|
| Bureau of Reclamation | 441.5 | 228.9 | 52% |
| Citizens Utility - Telephone | 1,328.0 | 169.0 | 13 |
| American Telephone & Telegraph Company | 92.4 | 39.1 | 42 |
| Black Mesa Pipeline Company (coal slurry) | 76.2 | 14.8 | 19 |
| Transwestern Pipeline Company | 119.46 | 29.7 | 25 |
| Four Corners Pipeline Company | 65.0 | 23.4 | 36 |
| El Paso Natural Gas Company | N.A. | N.A. | - |
| Atchison, Topeka & Santa Fe | 42.0 | 15.5 | 37 |
| Three Stations | 3.0 | 1.0 | - |

Source: BLM data.

Colorado River from Bullhead City; and three major natural gas bulk transmission-type pipelines. The right-of-way mileage of these utility corridors in total and on BLM land is shown in Table II-29.

The rights-of-way as discussed above, together with a number of smaller ones, provide access to remote parts of the study area. This access is necessary for the administration of the public lands, and recreationists use the roads for rock hounding, hunting, and other activities.

There are three communication sites in the ES area, as follows:

- Mt. Wilson (2 operators)
  - Bureau of Reclamation
  - National Park Service
- Mt. Perkins (2 operators)
  - National Park Service
  - State of Nevada, Division of Fish and Game
- Oatman Site (4 operators)
  - Mohave County
  - Santa Fe Railroad
  - Motorola, Inc.
  - Citizens Utility Company

Mohave County operates three sanitary landfill sites at Kingman Industrial Park, Silver Creek (Bullhead), and Fort Mohave (Lower Mohave Valley). There are three other landfill areas located near Chloride (30 acres), Truxton, and Dolan Springs, as shown in Figure II-20.

Also scattered throughout the county are 15 transfer sites where trash, etc., is picked up by a contractor and hauled to the nearest sanitary landfill site (Figure II-20).

Mohave County has through the Recreation and Public Purposes Act leased two sites for development at Dolan Springs (16 acres) and Golden Valley (10 acres).

(4) Planning Controls. The use of public lands is a major determinant of county land use patterns, and the agency involved administers land both in and out of the county. Each public land management agency determines policy and planning in a different way with different goals, each according to its stated purposes. This fragmented situation creates difficulties in county level planning. Intermingled and adjacent private land is affected by policy and planning on public lands.

Both state and county officials believe that a substantial part of future development should be along and near the Colorado River, because of water availability. Plans for additional recreation and town sites are being considered for this area, but with stronger use controls.

Having experienced considerable population growth and development in the past 15 years, along with the attendant problems as well as benefits, Mohave County is concerned for the future and actively planning for it. The Mohave County Planning and Zoning Commission completed its General Development Plan in September 1976. A major objective of this plan is to encourage diversification of industry toward a broader employment base. Expansion of tourism will also be encouraged, but caution will be exercised to avoid damage to the very resource which is the attraction for tourism.

The presence of planning and zoning in Mohave County has not had a significant impact on public lands, except for the lack of effective control on speculative subdivisions. These subdivisions tend to make the intervening public lands nearly unsuitable for large-scale resource management and the lack of control has allowed them to spread over wide areas.

The present zoning in Mohave County may be considered inadequate. The principal shortcomings include the inability to prevent or modify land use conflicts and the failure to prevent subdivision activity in remote areas without roads, water sources, sewers, or other essential public needs. Moreover, the comprehensive land use plan now in existence is too general to be of much practical use.

A total of 39,130 acres in the ES area have been proposed by a 1974 interagency task force* for transfer out of Federal ownership to the state, as shown in Table II-30. All of these sites were considered as having potential for new town development. The county, however, did not concur with this finding and considered only Katherine Landing and Bullhead City suitable for further urbanization. Further, the state considered that only 1280 acres of land just east of the city (Sections 6, T20N, R21W and 31, T21N and R21W) should be transferred and developed. All of these proposed transfers were recommended for further study and evaluation and were to involve an indemnity in lieu selection and exchange for state land. Further, the Temple Bar and Bonelli Bay lands are under temporary withdrawal status for classification by the BLM.

The BLM has also identified four custodial allotments (Cook Canyon, Jones Spring, Valentine, and Hualapai Ranch) totaling 19,614 acres for transfer as noted in Chapter I. In addition, several areas have been identified for transfer, exchange, or disposal under the MFP decisions shown in Table I-14 and Figure I-13. The disposition of these lands, however, is subject to actions outside of the proposed action and the timing of such is not known.

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*Lower Colorado River Land Selection Program, Office of State Land Department Intra-Agency Task Force, State of Arizona, 1974.

TABLE II-30

ACRES IDENTIFIED FOR TRANSFER OUT OF FEDERAL OWNERSHIP - ES STUDY AREA

| Area | Acres | Managing Agency | Allotment |
| --- | --- | --- | --- |
| Hualapai Wash | 5,120 | NPS | Big Ranch |
| Temple Bar | 5,120 | BLM | Big Ranch |
| Bonelli Bay | 22,080 | BLM | Big Ranch |
| Katherine Landing | 2,260 | BLM | Portland Spring |
| | 1,950 | NPS | and Thumb Butte |
| Bullhead City | 12,340 | BLM | Silver Creek |
| | 1,360 | NPS | |
| Total | 30,700 | BLM | |
| | 8,430 | NPS | |

Source: General Plan Development, Mohave County, MCP2C, 1976.

TABLE II-31

REGIONAL RECREATION LANDS WITHIN MOHAVE COUNTY

| Agency | Area | Acres |
| --- | --- | --- |
| National Park Service | Lake Mead National Recreation Complex, Arizona | 1,272,256 |
| Fish and Wildlife Service | Topock Marsh National Game Preserve* | 4,000 |
| Bureau of Land Management | Wild Cow Campground* | 370 |
| | Burro Creek Campground* | 10 |
| | Windy Point Campground | 10 |
| | Pack Saddle Picnic Area | 3 |
| Arizona State Parks | Lake Havasu* | 13,000 |
| | Alamo Lake* | 4,900 |
| Mohave County Parks | Hualapai Mountain Park | 2,500 |
| | Chloride, Dolan Springs, and Sacramento Valley Parks | Unknown |

*Outside ES study area.

Source: Bureau of Land Management.

b. Recreational Land Use

(1) Recreational Resources. As noted above, Mohave County is a composite of Federal, state, and privately-owned lands totaling some 8.5 million acres. Recreational resources and opportunities occur on nearly all segments of these lands, with most of them concentrated on Federally-owned public lands. Table II-31 identifies the lands that have been set aside specifically for recreational use and the several agencies responsible for their management; Figure II-23 shows the location of each recreation area within the ES study area. Specific land-based recreation areas within the region are considerably less extensive in scope and number than water-based resources.

In addition, Mohave County operates three parks in the ES area: Chloride, Dolan Springs, and Sacramento Valley parks. These are community parks and not within the scope of natural resource recreation evaluation. Kingman also has several community parks which will not be evaluated. West of Kingman is a 720-acre public rifle, pistol, and archery range sponsored by Arizona Game and Fish Department and managed by a local sportsman's club.

(2) Recreation Use Patterns and Activities. Recreation participation in the region is mostly concentrated in the water-based resources adjacent to the ES area. The Colorado River-lake corridor, providing more than 1000 miles of shoreline in Mohave County, accounts for most of this use.[1] For example, the Lake Mead National Recreation Area records 6.9 million visitors annually.[2] Hoover Dam, in itself a major attraction, receives more than 600,000 visitors on a yearly basis.[3,4] Visitor-use activities at the Lake Mead complex in 1976 are summarized in Table II-32.

The related 1976 travel patterns through central Mohave County are shown in Table II-33. Travel counts at specific recreation sites adjacent to the Cerbat/Black Mountain Planning Units are shown in Table II-34. Access to most of these sites occurs through these planning units.

Recreation participation in the ES area is limited to a few primary activities. These include hunting, camping, picnicking, rock hounding, ORV use, and sightseeing (Table II-35). Visitor-use figures, user distribution, and management considerations are discussed in detail below.

- Hunting

Hunting is one of the most popular recreation activities within the Cerbat/Black Mountain Planning Units. Participation figures indicate that hunting is the most frequent recreation activity in the Black Mountain Planning Unit; in the Cerbat Mountain Planning Unit, hunting ranks second to sightseeing. Table II-36 illustrates the number of visitor-days recorded harvesting major game species.

The Arizona Game and Fish Department has designated game management units throughout the state. (See Figure II-24.) Except for overlaps into the Lake Mead National Recreation Area, units 15A and 15B are almost entirely within the Cerbat planning unit and units 15C and 15D are entirely within the Black Mountain Planning Unit. The eastern arm of the Cerbat planning unit lies within part of game management unit 18A.

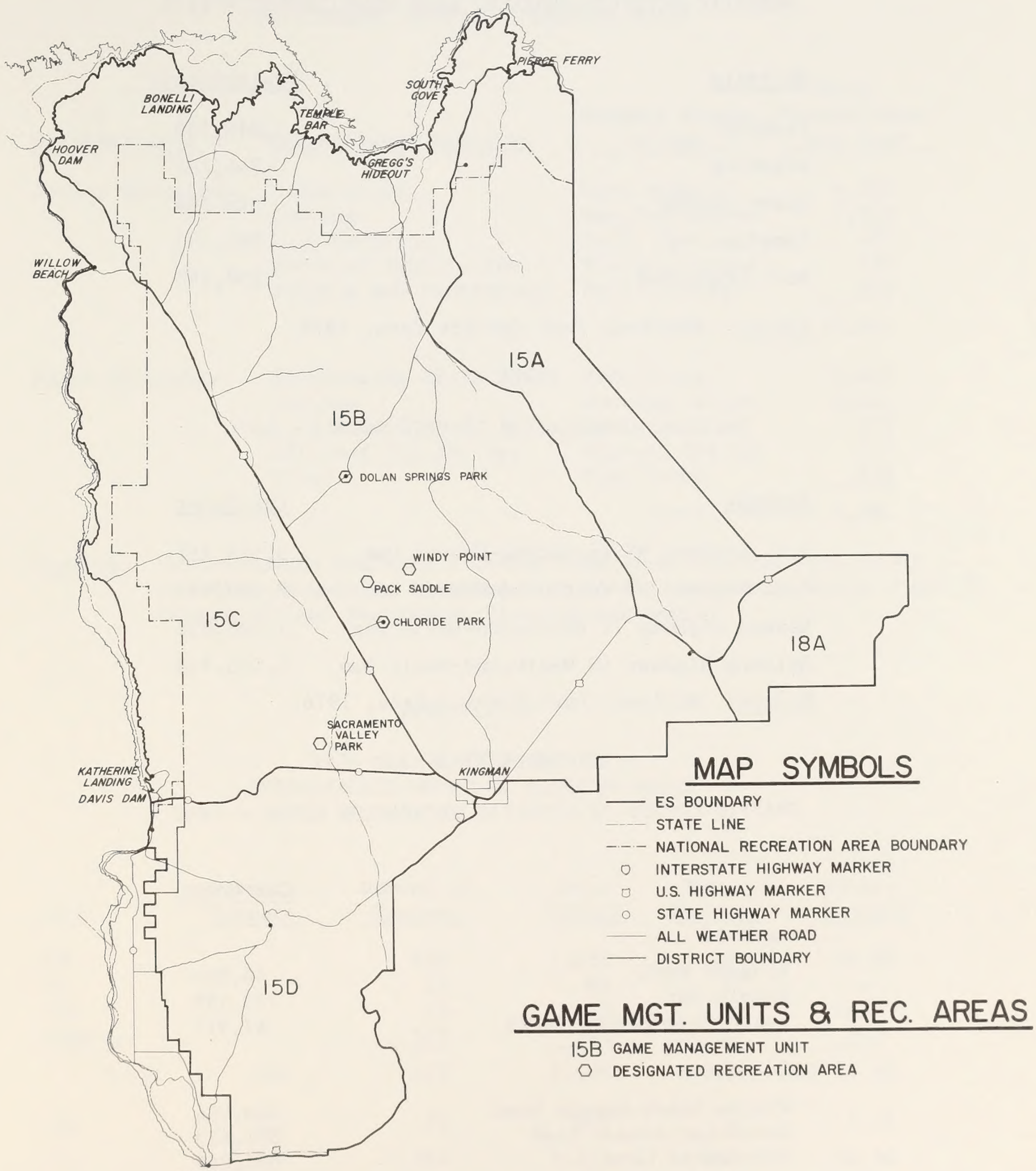


**FIGURE II-23 GAME MANAGEMENT UNITS AND RECREATION AREAS**

TABLE II-32

SPECIFIC ACTIVITY PROFILE, LAKE MEAD COMPLEX - 1976

| Activity | Visitor-days |
|---|---|
| Fishing | 1,010,359 |
| Swimming | 744,244 |
| Water Skiing | 326,866 |
| Camping | 986,039 |
| Boat Launching | 358,190 |

Source: National Park Service data, 1976.

TABLE II-33

REGIONAL CIRCULATION TRAFFIC COUNTS - 1976

| Highway | Car Count |
|---|---|
| U.S. Highway 93 Eastbound-Hoover Dam | 3,576,757 |
| U.S. Highway 93 Westbound-Hoover Dam | 3,203,993 |
| Nevada Highway 77 Eastbound-Davis Dam | 1,028,852 |
| Arizona Highway 68 Westbound-Davis Dam | 1,053,733 |

Source: National Park Service data, 1976.

TABLE II-34

TRAFFIC COUNTS AT SPECIFIC RECREATION SITES - 1976

| | Car Count |
|---|---|
| Lake Mead | |
| Kingman Wash | 46,054 |
| Temple Bar | 153,259 |
| South Cove-Pierce Ferry | 47,917 |
| Lake Mohave | |
| Willow Beach Access Road | 359,064 |
| Katherine Access Road | 891,623 |
| Cottonwood Cove | 497,248 |

Source: National Park Service data, 1976.

TABLE II-35

RECREATIONAL ACTIVITIES AND VISITOR-DAYS -
CERBAT/BLACK MOUNTAIN PLANNING UNITS

| Planning Unit | Recreational Activity | Primary Season of Use | Total Visitor-days per Year |
|---|---|---|---|
| Cerbat Mountains | Sightseeing | Year-round | 6,762 |
| | Hunting | Hunting Season | 5,810 |
| | Rock Hounding | Fall, Spring | 677 |
| | Off-road Vehicle Use | Winter, Spring | 932 |
| | Camping and Picnicking | Fall, Spring | 823 |
| | | Total | 15,004 |
| Black Mountains | Sightseeing | Year-round | 1,666 |
| | Hunting | Hunting Season | 2,434 |
| | Rock Hounding | Winter | 378 |
| | Off-road Vehicle Use | Winter, Spring | 223 |
| | Other | Year-round | 679 |
| | | Total | 5,380 |

Sources: Unit Resource Analyses - Cerbat Mountains Planning Unit 02-03 and Black Mountains Planning Unit 02-02, Recreation Steps 3 and 4, Bureau of Land Management Planning Documents.

TABLE II-36

1976 DEER HARVEST REPORT -
CERBAT/BLACK MOUNTAIN PLANNING UNITS

| Unit | Permits Issued | Number of Hunters | Days Hunted | Total Harvest | Total Hunter Success |
|---|---|---|---|---|---|
| 15B | | 240 | 1,234 | 38 | 15.8% |
| 15C | | 17 | 66 | 0 | - |
| 15D | | 12 | 19 | 2 | 16.7 |
| Unknown | | 175 | 975 | 10 | 5.7 |
| Total | 500 | 425 | 2,294 | 50 | 11.8% |
| 15A | 125 | 99 | 509 | 4 | 4.0% |
| 18A | 1,399 | 1,063 | 5,251 | 197 | 18.5% |

Source: Arizona Game and Fish Department.

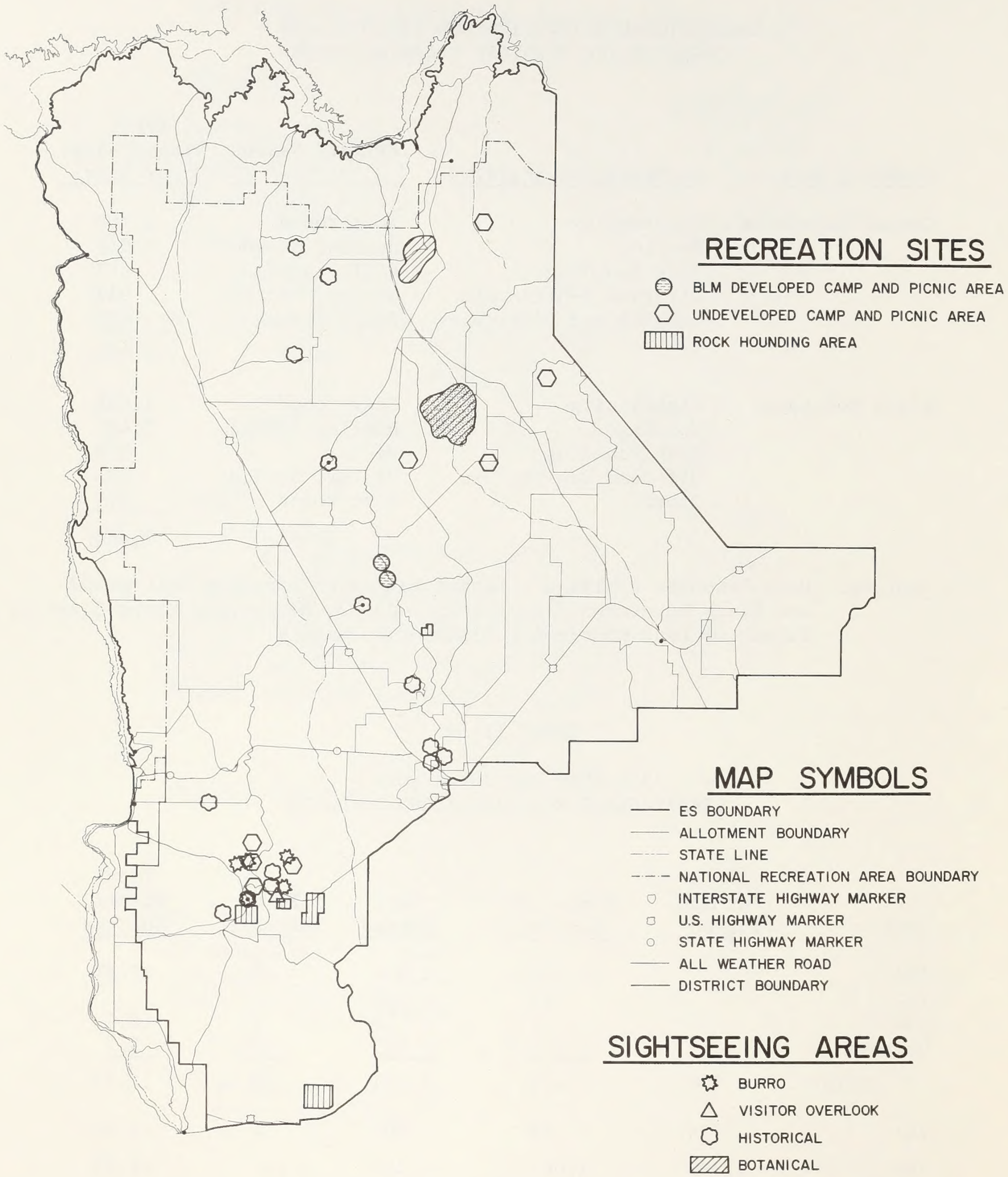


**FIGURE II-24 RECREATION SITES AND SIGHTSEEING AREAS**

- Deer Hunting. Deer hunting is the major big game attraction in the Cerbat planning unit but is a relatively minor activity in the Black Mountain unit; the total 1976 deer harvest for the Black Mountain unit was two (Table II-36). In game unit 15A, 125 deer permits were issued in 1976 by Arizona Game and Fish; in game units 15B, 15C, and 15D, 500 deer permits were issued collectively.[5] Game unit 18A received 1400 deer permits but only the northwest corner of 18A lies within the BLM planning unit.[6] Deer harvest records for 1976 indicate the distribution of hunting activity in the two planning units (Table II-36).

Well over half of the deer hunts in the BLM planning units were within the Cerbat unit. Game units 15C and 15D receive very little known deer hunting pressure. Hunter success figures for the game management units collectively fall well below the state average of 18.7%,[7] indicating that the ES area is a relatively low-production deer hunting region. Due to poor range conditions, poor fawn crops, and a generally declining deer herd, the Arizona Game and Fish Department has found it necessary to reduce hunting pressures in the Cerbat and Music mountains game management units. This has been accomplished through a firearms restriction, whereby only muzzle-loading guns may be used. BLM quality evaluation data indicate that the Cerbat, Music, and Cottonwood mountains provide the most productive deer hunting habitat in the planning units.

- Bighorn Sheep. This is the primary big game species in both planning units; more than 17% of the hunting permits for this species are issued for the ES area. Mt. Wilson and the southern half of the Black Mountain range are the most productive sheep territory within the area and have received BLM management framework directives for primary management as wildlife habitat. Three-hundred fifty applicants sought one of the 14 bighorn permits issued for the region in 1976. Hunter success approached 80% that year.

- Mountain Lion. Mountain lion hunting in both planning units occurs yearlong; yet hunter success has been marginal in recent years. Two lions were reportedly taken within the Cerbat unit in 1976; no lions were harvested in the Black Mountain unit.[8]

- Pronghorn. Pronghorns, consisting of three small herds of about 65 animals in the Cerbat unit, have provided very limited hunting in recent years. No permits were issued by Arizona Game and Fish in either planning unit in 1977.[9]

- Upland Game. More visitor-days are spent in pursuit of upland game than any other game species in the planning units. The Cerbat and Music mountains provide the most favorable upland game opportunities for hunter success. Participation accounts for 3021 visitor-days in the Cerbat Planning Unit and 1365 visitor-days in the Black Mountain Planning Unit.[10] Dove and quail hunter success in both planning units approaches 4.6 and 4 kills, respectively, per trip.[11]

- Waterfowl. Infrequent opportunities exist for waterfowl hunting; Red Lake Playa will provide habitat for migrating ducks and geese during some wet monsoon seasons. Stock tanks also are used occasionally by migrating waterfowl. Only 68 visitor-days per year associated with waterfowl hunting are reported.[12]

- Small Game. Both planning units experience yearlong hunting pressure for small game. The pressure is essentially equal in both planning units: 180 and 150 visitor-days were reported in the Cerbat and Black Mountain units, respectively. Approximately 2.5 rabbit kills per trip are reported, bettering the statewide success rate of only 1.3 kills per trip.[13]

- Camping and Picnicking

Limited camping and picnicking occurs within the two planning units; more visitors use results from participation in associated activities (i.e., hunting, ORV use, sightseeing, and rock hounding). Only two BLM developed use areas exist within the two planning units, Pack Saddle Mountain and Windy Point in the Cerbat Mountain Planning Unit (Figure II-23). Located 30 miles northwest of Kingman, these areas receive use of less than one vehicle per day per year.[14] Pack Saddle incorporates 3 acres and comprises five picnic units consisting of picnic tables, fire grates, toilets, and trash containers. Windy Point comprises 10 acres and supports seven units with facilities similar to those of Pack Saddle. Both campsites are located at the upper elevations of the Cerbat Mountains and offer spectacular views of the surrounding valleys.

Four potential sites in the Cerbat planning unit were evaluated by the BLM planning process for the provision of day and overnight recreational opportunities (Figure II-24). The BLM recreation analyses indicated that the outstanding scenic features and varied opportunities for other activities in the area make these identified campground locations ideal for the purpose considered.[15] However, no facilities are provided or planned within the near future.

The Black Mountain Planning Unit has no developed picnicking and camping facilities; however, participation occurs in association with other activities. Most camping and picnicking are in areas near to developed springs and abandoned mining camps. Primary use of "primative" picnicking and camping facilities is restricted to the vicinity of Oatman and Highway 68; areas of concentrated use are Grapevine Canyon, Secret Pass, Fig Springs, Gold Road, and east of Katherine Wash (Figure II-24). Only 56 visitor-days of camping and picnicking are attributed to the Black Mountain Planning Unit.[16] Availability of other areas and lack of developed facilities limit the popularity of locations within the unit. Allotments reporting picnicking and camping use include Silver Creek, Thumb Butte, Black Mountain; such use is also reported for the unallotted land in the southern portion of the planning unit.

- Rock Hounding

Analyses of existing data indicate rock hounding is a very popular activity in the ES area. Large portions of the area are highly mineralized. Exposure of many specimens from past and present mining activity attracts collectors. A great number of specimen collectors are retired persons.

Principal rock hounding areas are Katherine Landing, Gold Road, Ed's Camp, White Hills, Chloride, and Mineral Park (Figure II-24). Participation totals are 677[17] and 378[18] visitor-days in the Cerbat and Black Mountain Planning Units, respectively. Allotments reporting significant rock hounding activity are Ft. McEwen, Mud Springs, and Silver Creek within the Black Mountain unit and Stockton Hill, Cerbat, and Cane Springs in the Cerbat unit.

- Off-road Vehicle Use

An extensive network of primitive roads in the ES area provides access to the interior for four-wheel drive vehicles. Use of the area by ORVs is not as extensive as might be expected, probably due to the harshness of the environment and small local population. Steep and rocky terrain make travel slow and difficult, water is scarce, and cross-country travel often impossible. Potential hazards include open mine shafts, extreme seasonal temperatures, and flash floods.

ORV use, occurring primarily during winter and spring months, is reported as 932[19] visitor-days in the Cerbat unit and 223[20] visitor-days in the Black Mountain unit. The allotments in the latter recording the most use are Black Mountain and Curtain; the allotments in the former receiving substantial use are Feldspar, Cane Springs, and Canyon Ranch.

The Cerbat unit was divided into seven areas, and the Black Mountain unit into six areas by BLM for ORV quality evaluations. Figure II-25 illustrates the evaluation areas and Table II-37 presents BLM quality determinations. Quality ratings were based on BLM criteria and rated from A to C, with an A evaluation representing a high-quality experience and C a poor experience.[21,22]

Off-road vehicle use has the greatest potential for present and future conflicts. Conflicts of ORV use result from impacts on the recreation resource and the recreating public. Substantial documentation exists on the effects of unrestricted use of ORV. Deterioration of water quality, harassment and displacement of wildlife, destruction of vegetative cover and unique species, soil compaction, dust generation, and erosion are a few of the natural disturbances precipitated by uncontrolled ORV use. These detrimental effects measurably alter the character of the landscape and its desirability for recreational use. Because the study area is arid, the ability of the landscape to rejuvenate itself is impared for many years. This long-term impairment detracts from the area's ability to produce a quality experience. Additionally, unrestricted ORV use may actively block access by other recreationists, thus affecting their participation.

- Sightseeing

Sightseeing participation is higher than that for any other recorded activity because of the heavy use of highways traversing the area. Sightseeing participation may be divided into two major categories: sightseeing that occurs within the ES area, and sightseeing that occurs from the major highway corridors traversing the area.

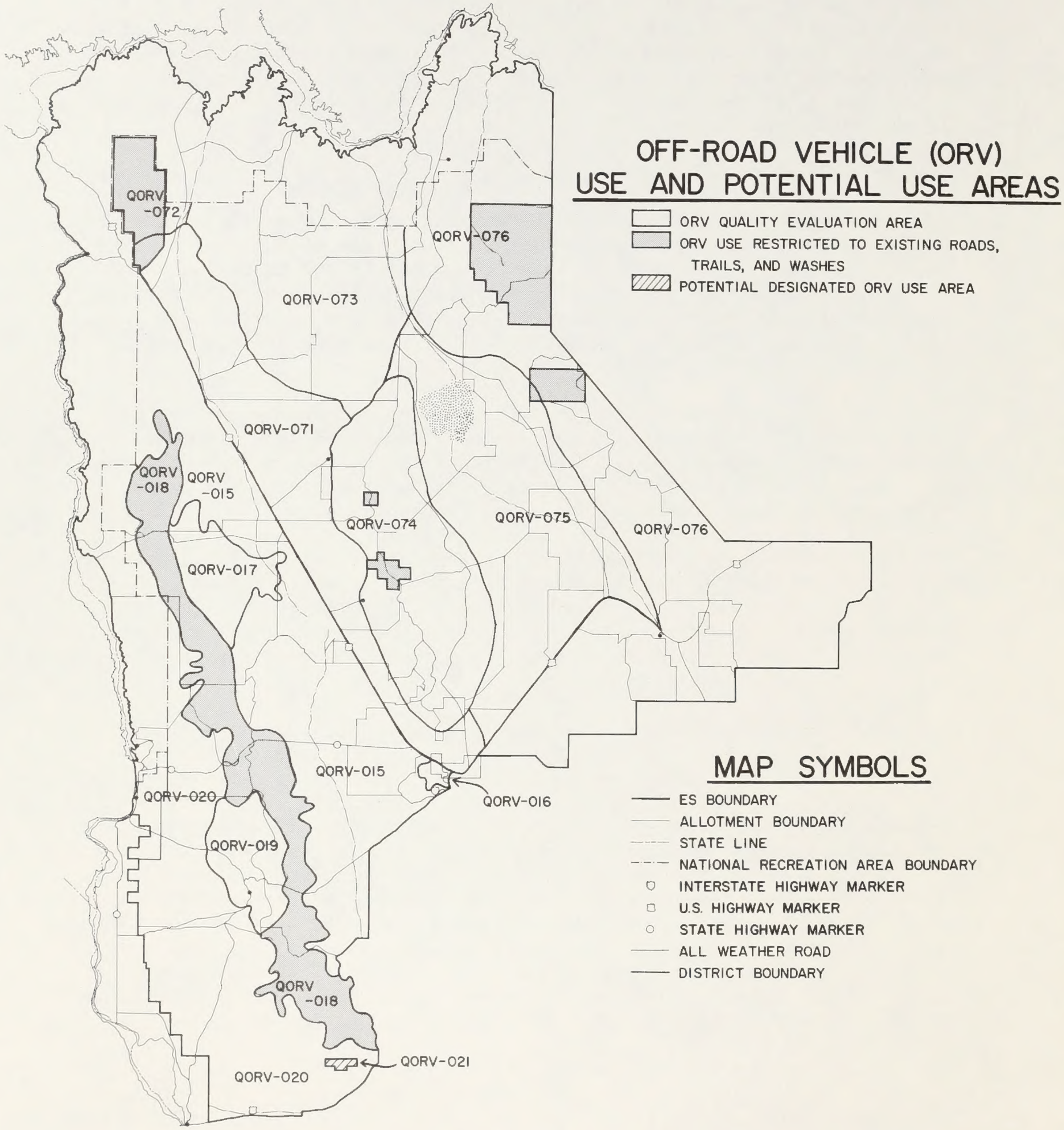


FIGURE II-25 ORV USE AREAS

## TABLE II-37

## OFF-ROAD VEHICLE QUALITY DETERMINATIONS

| Planning Unit | Map Symbol | Quality | Locational Name | Comments |
|---|---|---|---|---|
| Cerbat | QORV-071 | C | Sacramento-Detrital Valley | Level to moderately sloping terrain makes ORV use possible in most areas. Potential hazards: seasonal flash flooding, poisonous reptiles, and extreme seasonal temperatures. |
| | QORV-072 | C | Wilson Ridge | Steep and rugged terrain restricts travel to existing roads. Potential hazards: rugged terrain, extreme seasonal weather conditions, and potential flash flooding. |
| | QORV-073 | C | White Hills | Terrain varies from gently sloping to steep and rocky; use restricted to roads in mountainous areas. Potential hazards: abandoned mining operations, isolation from population centers, and rugged terrain. |
| | QORV-074 | C | Cerbat Mountains | Rugged topography restricts use to existing roads. Potential hazards: abandoned mining operations, rugged terrain, flash flooding, and extreme weather conditions. |
| | QORV-075 | C | Hualapai Valley | Nearly level to gently sloping terrain. Potential hazards: extreme weather conditions, poisonous reptiles, and possible flash flooding. |
| | QORV-076 | B | Music Mountains-Grand Wash Cliffs | Rugged terrain prohibits cross-country travel. Potential hazards: isolation from population center, extreme seasonal temperatures, and rugged terrain. |
| Black Mountains | QORV-015 | C | Sacramento Valley | Level to moderately sloping. Potential hazards: abandoned mine shafts and flash flooding. Overall rating is fairly low. |
| | QORV-016 | C | West Kingman Area | Small size, extremely rocky terrain and drop offs restrict use to existing roads. Potential hazards: drop offs, rugged terrain, and extreme seasonal temperatures. |
| | QORV-017 | C | Ft. McEwen | Numerous cliffs and rocky waste. ORV cross-country use in some areas. Overall quality is moderate. Potential hazards: flash flooding and extreme seasonal temperatures. |
| | QORV-018 | C | Black Mountain | Extremely rugged terrain, vehicles restricted to existing roads. Low quality for ORV use. Potential hazards: sheer cliffs, open mine shafts, and flash floods. |
| | QORV-019 | C | Oatman Area | Very steep topography, low quality rating. Potential hazards: flash flooding, steep slopes, and extreme seasonal temperatures. |
| | QORV-020 | C | Mohave Area | Gently sloping to steep terrain. Overall rating low. Potential hazards: boulder-strewn areas, open mine shafts, and flash flooding. |
| | QORV-021 | C | Sphinx Mountain Area | Topography varies from 4-24% and steeper. Overall quality low. Potential hazards: extreme seasonal temperatures and flash flooding. |

Source: Unit Resource Analyses — Cerbat Mountains Planning Unit 02-03 and Black Mountains Planning Unit 02-02, Recreation Steps 3 and 4, Bureau of Land Management planning documents.

Sightseeing within the two units accounts for 8428 days,[23] most of them in the Black Mountain unit. Absence of "within-unit" activity probably results from poor accessibility to regular automobile travel. Table II-38 lists sightseeing use figures attributable to BLM land resulting from travel on many of the highway systems. Analyses of the data indicate the extreme importance of public lands for providing a scenic backdrop for people traveling through the region and the need to maintain the scenic character.

Participation in sightseeing may be classified as historical, geological, botanical, and zoological.

- Historical. The ES area has numerous remnants from previous mining activities. Discovery of gold and other precious metals in the early 1860s precipitated the construction of small, short-lived boom towns. Abandonment of these small mining settlements left a rich history that attracts a number of sightseers and artifact hunters. The most popular locations include Oatman, Mineral Park, Cerbat, Stockton, Goldroad, and Hackberry (Figure II-24).[24,25]

- Geological. Travelers on the highways and roads of the planning unit are treated to a rich diversity of geologic phenomena, the most striking visual features of the region. Boundary Cone and Sitgreaves Pass are located on the Oatman Road and the entire length of the Cerbat Mountain range and nearly that of the Black Mountain range are visible from U.S. Highway 93. The Grand Wash Cliffs and Red Lake Playa are visible from the roads traversing the Hualapai Valley and approaching Pierce Ferry on Lake Mead.

- Botanical. Botanical sightseeing is concentrated in the Cerbat Mountain Planning Unit. Vegetative communities, extending from the creosote bush at low elevations to pinyon-juniper at higher elevations, account for specialized sightseeing and contribute greatly to the overall recreation experience. Two notable areas identified by BLM as having unique botanical qualities are the Joshua tree forest in the North Music Mountains and Red Lake.[26]

- Zoological. Wildlife in the ES area provides sightseeing opportunities for those wishing to take time to participate. Two of the most desired animals to view are bighorn sheep and wild burros. Several popular burro observation areas are located in the Black Mountains (Figure II-24). Other animals observed include deer, dove, quail, fox, mountain lion, and raptors.[27,28]

c. Agriculture

In Mohave County only 8100 acres are in agriculture, which amounts to only one-half of one percent of the state total. In the ES area southeast of Red Lake, there are two operational farms of approximately 300 acres each. They are primarily a wheat/alfalfa crop operation and cattle occasionally are allowed to graze the land after harvest. The Crozier Canyon allotment currently has 10 acres of oats under cultivation. At one time 250 acres were farmed. It is estimated that there is a potential for 1000 acres to be cultivated if the existing irrigation system were repaired.

TABLE II-38

VISITOR-DAYS FROM TRAVEL ON AREA ROADS -
CERBAT/BLACK MOUNTAIN PLANNING UNITS

| Planning Unit | Road System | Visitor-days |
|---|---|---|
| Cerbat Mountains | Highway 93 - Nevada State Line Junction 68 | 49,883 |
| | Highway 93 - Junction 68 - Kingman | 7,057 |
| | Highway I-40 - Kingman - Valentine | 29,200 |
| | Temple Bar Road | 649,743 |
| | Other Access to Lake Mead National Recreation Area | 18,421 |
| | Total | 754,304 |
| Black Mountains | Highway I-40 - Junction 95 | 6,309 |
| | Highway I-40 Yucca - State Line | 39,712 |
| | Highway I-40 Yucca - Kingman | 12,653 |
| | State Highway 68 | 15,671 |
| | State Highway 93 - Nevada State Line - Junction 68 | 49,883 |
| | State Highway 93 - Junction 68 - Kingman | 7,057 |
| | Total | 131,285 |

Source: Bureau of Land Management, Planning Area Analysis.

The 600 acres of farming in the ES area are irrigated from well water which supplies a circular sprinkler system. The lack of surface water and the cost of drilling and operating deep wells are the major factors limiting crop production. Stony, rough topography also limits farming in the mountain area. (See Figure II-20 for form locations.)

d. Livestock Grazing

The predominant land use in the ES area is livestock grazing. The amount of land used for grazing purposes by allotment under each proposed grazing system is discussed in Chapter I. Land ownership patterns are shown in Figure II-19. The following discussion briefly describes the livestock operational characteristics of these grazing lands. Economic aspects of ranching are discussed in subsection 12 below.

(1) Grazing Patterns. Grazing within the ES area does not follow a consistent pattern of summer use at higher elevations and winter use at lower elevations. Only on a few allotments having significantly higher elevations is this movement pattern followed to some extent. Other allotments are composed entirely of higher country or lower (desert) country and are operated strictly on a yearlong schedule.

The uniqueness of the ES area, having ephemeral, ephemeral/perennial, and perennial rangelands, also necessitates variations of the usual grazing patterns. For example, the ephemeral ranges are grazed only when annual forage is available.

The use of pasture fencing to control livestock movement has not been extensive in the ES area. Ranchers in the area utilize water location and availability as a means of distributing and moving cattle. They also utilize livestock holding facilities located near waters for ease in rounding up cattle.

(2) Livestock Numbers. Mohave County livestock numbers from 1970-77 are presented in Table II-39. Cattle numbers from 1970-74 were fairly constant with a slight increase indicated in 1975. In 1976 and 1977 there was a marked increase in total cattle and even a more significant increase in cows that calved. During these same years (1976 and 1977) cattle numbers for the state declined. The increases in 1976 can partially be accounted for by cows being carried over because of the depressed cow market in 1975. A change in method of reporting by the state may also have attributed to the increases as reported.

The number of beef cows in Arizona (Table II-39) during the 1970s indicates a relatively stable herd throughout the state with peak numbers occurring in 1975. These trends are in line with those throughout the United States and are following the cattle cycle closely. The number of cattle and calves by use and weight groups in Mohave County and in the ES area is shown in Table II-40.

TABLE II-39

CATTLE NUMBERS FOR ARIZONA AND MOHAVE COUNTY - 1970-77
(in thousands)

| Year | Arizona: All Cattle | Arizona: Beef Cows | Mohave County: All Cattle | Mohave County: Cows Which Calved | Mohave County: Other Cattle |
|---|---|---|---|---|---|
| 1970 | 1,302 | 367 | 38 | 22 | 16 |
| 1971 | 1,289 | 346 | 37 | 21 | 16 |
| 1972 | 1,295 | 348 | 36 | 21 | 15 |
| 1973 | 1,420 | 342 | 36 | 21 | 15 |
| 1974 | 1,390 | 351 | 37 | 21 | 16 |
| 1975 | 1,170 | 372 | 40 | 22 | 18 |
| 1976 | 1,280 | 312 | 56 | 33 | 23 |
| 1977 | 1,065 | 319 | 56 | 32 | 24 |

Sources: Arizona Crop and Livestock Reporting Service, Arizona Agricultural Statistics.

TABLE II-40

CATTLE AND CALVES IN MOHAVE COUNTY AND IN THE ES AREA* - JANUARY 1, 1977

| | All Cattle | Beef Cows | Over 500 Lbs: Replacement Heifers | Over 500 Lbs: Steers and Heifers | Over 500 Lbs: Bulls | Under 500 Lbs |
|---|---|---|---|---|---|---|
| Mohave County | 56.0 | 32.0 | 5.3 | 10.2 | 1.4 | 7.1 |
| ES Area | 8.7 | 5.0 | 0.8 | 1.6 | 0.2 | 1.1 |

*Estimated distribution based on 7,624 cyls, plus calves; percentage distribution for Mohave County:

Number of beef cows (32) for Mohave County divided by number of total cattle (56) for Mohave County = 57% cows.
Number of beef cows for ES area is computed by taking the total cattle numbers (8.7) and multiplying by 57% to equal number of beef cows (5).
Other livestock classes (replacement heifers, steers and heifers, bulls, and calves) were computed proportionately as were cows.

Sources: Arizona Agricultural Statistics, Arizona Crop and Livestock Reporting Service.

(3) Herd Composition. Essentially all of the permittees in the ES area have a cow/calf operation and also run yearlings with their cow herd. Some of the larger permittees with more than one grazing unit in the ES area run cows and calves on one ranch and use the other ranch as a steer growing operation. Although it is not possible to report the exact composition of all herds in the impact area, the average herd for this area is as follows: 50% producing cows; 20% replacement heifers, yearlings, and two-year-olds; 3% bulls (one bull per 10-12 cows); 3% horses, milk cows, etc.; 11% sale steers; 8% sale heifers; and 3% cull cows.

These percentages do not agree exactly with those presented in Table II-40. Moreover, the percentages within each group vary depending on range conditions. In years with ample rainfall and increased forage, additional steers are added, while in years with less than average rainfall livestock numbers are reduced.

In addition to cows, the ranchers in the ES area will add to their herds with purchased steers or carryover animals when rainfall permits the periodic use of ephemeral range. An advantage of this type of operation is the option to adjust numbers to meet available forage. The primary liability for this operation is the capital required to purchase animals and turn them over year after year.

(4) Breeds of Cattle. Most of the cows in the ES area are cross-bred with many being of nondescript origin. Of animals sold through the Mohave County Cattle Grower's auction, Brahman breeding is evident in approximately 55%, Hereford breeding in about 42%, with approximately 3% showing evidence of other breeds. Planned, seasonal breeding is not evident; since in most instances bulls are left out on a yearlong basis, calves come on a yearlong basis. Various breeds of bulls are used by the different ranchers within Mohave County and the ES area.

(5) Herd Management. The stocking rate for the ES area may be calculated by dividing the 2.24* million acres by 7623 cows yearlong. This equates to 274 acres per cyl or approximately two cows per section. These stocking rates emphasize the relatively low productivity and variability of the ES area rangelands. Yearlong breeding is practiced on most allotments within the ES area. Generally in this area, heifers will be approximately two years of age before they reach sexual maturity and are likely to be three years old before calving. From interviews with the individual allottees, the percent calf crop quoted ranged from 50-65%, with calves being born year round.

The primary supplemental feed used throughout the impact area is salt. It becomes a distribution tool as it is placed in various areas to entice cattle into that area for grazing. The only other supplemental feed of significance is alfalfa hay and a small amount of commercial range feed used for horses, milk cows, and stock near ranch headquarters.

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*Public lands plus private controlled and uncontrolled lands. See Table I-2.

e. Mineral Resources

The Cerbat/Black Mountain Planning Units have historically been areas of extensive mining activity. Figure II-26 shows the approximate localities of known mineral occurrences. According to records of the BLM and the Arizona Bureau of Mines, there are approximately 700 active mining claims in the area. Land use locations of mining are shown in Figure II-20.

Precambrian crystalline rocks of the planning units are good sources of copper, lead, zinc, gold, and silver. This mineralization is usually associated with Mesozoic intrusions and quartz veining. Also, pegmatites with the Precambrian rocks have yielded tungsten, cadmium, beryllium, and other rare earths. Exploration for uranium, salt, natural gas, and oil has been undertaken within the sedimentary rock units. Perlite, rhyolite, tuff, feldspar, and industrial silica extraction has been and is being developed from the volcanics. The valley alluvium has yielded gold and platinum.

The extensive mining of copper, lead, zinc, gold, and silver has provided the area with a good resource base in the past. Duval Corporation operates an open pit mine west of Mineral Park (Ithica Peak) and a mill in Mineral Park itself. A large tailings pond associated with this operation lies about two miles to the south.

Pond waste on two occasions has flowed outside of the confines of the tailings pond proper owned by the Duval Copper Mine. The waste products have flowed across public lands and detract from open space values.

Similarly, the El Paso Natural Gas Corporation also operates the small Emerald Isle operation located about two miles west of Mineral Park. The operation consists of an open pit mine, mill, and tailings pond. In addition, two smaller feldspar and quartz quarrying operations are located immediately north of Kingman.

Various amounts of uranium have been found and they are associated with several of the copper, lead, and zinc properties. Uranium exploration is continuing within the sedimentary rock units. As there has been little success within these sedimentary units to date, more emphasis may be placed in the future on exploration for hydrothermal uranium mineralization. In summary, it is noted that grazing activities have not affected, nor do they affect, mineral resources. However, there remains the potential for some ranchers to lease or sell their lands for mineral extraction.

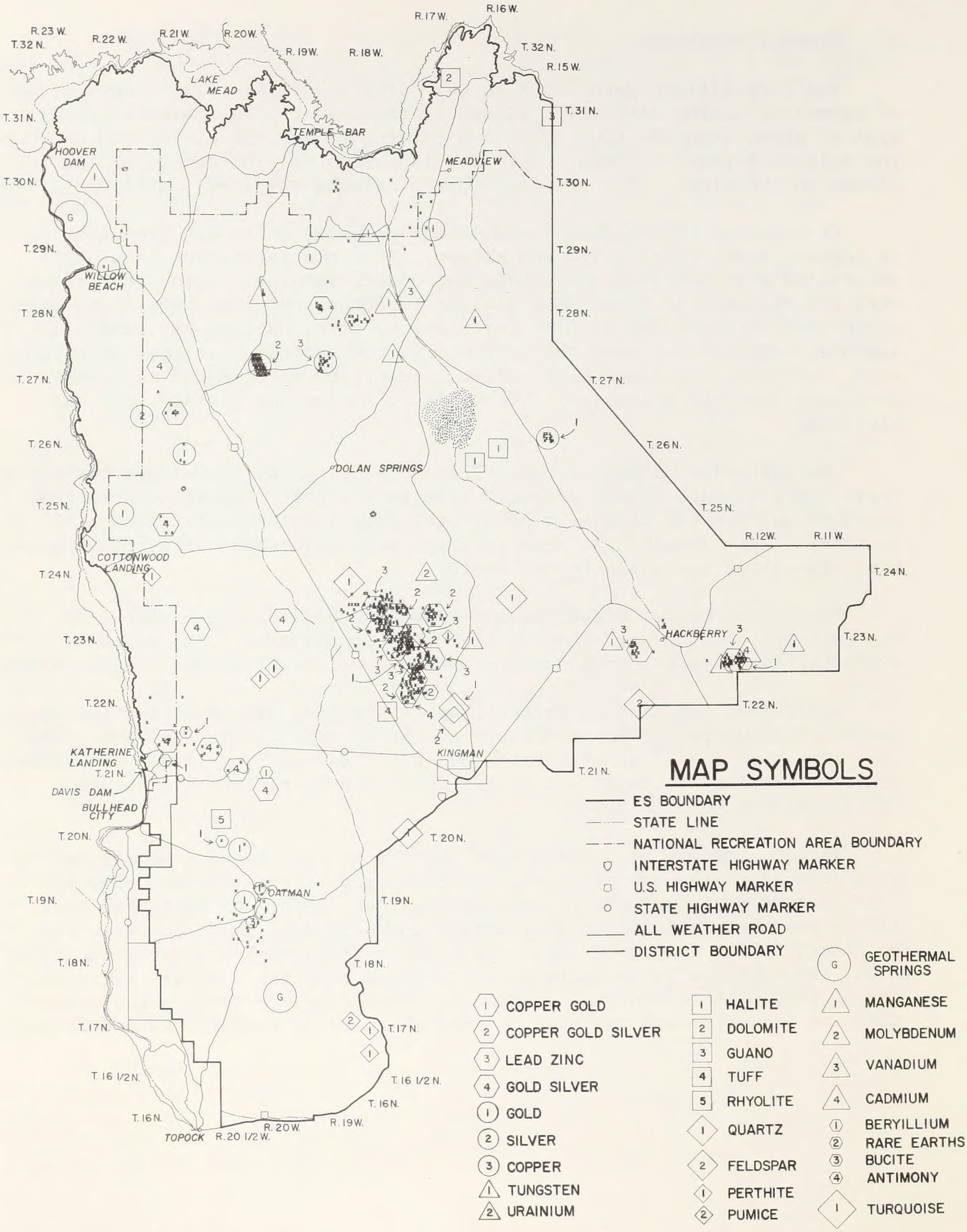



**FIGURE II-26 MINERAL RESOURCES – ES STUDY AREA**

f. Forest Resources and Other Vegetative Products

(1) Timber and Woodland Species. Timber (commercial and noncommercial) is virtually nonexistent in the ES area in regard to output products in, or convertible to, board feet. Near Mt. Tipton, there are small pockets or single trees of ponderosa pine. These isolated and scattered "wolf" trees do not constitute a bona fide timber type and they would not be acceptable for logging and/or specialized products. No known timber sales have been made in past years in the area. The greatest worth of these residual trees is their contribution to the general aesthetics of the immediate area, the area being accessible only by horse or foot. The elevation(s) within the mountainous areas barely includes the lowest elevation conducive for ponderose pine and, therefore, those pines that do occur are not thriving under optimum conditions. The representation of timber species is further jeopardized by the ingrowth of woodland species and mountain brush which precludes the ponderosa pine from becoming an acknowledgeable timber type.

The Cerbat/Black Mountain area exhibits a pinyon pine-juniper type above approximately the 3500 foot-elevation. The pinyon pine within the pinyon-juniper type is generally located at elevations varying from 4500-6500 feet. At the highest altitudes, the trees are scattered on south- and west-facing slopes and ridges. Growth is better generally in the upper part of the zone where precipitation is greater.

Historically, fires have occurred among the pinyon pine-juniper type and, as a result, these burned-over areas have remained devoid of pinyon-juniper and exhibit mountain brush types. The pinyon-juniper type is of no commercial value for fence posts due to the limited areas of trees which would have suitable quality, volume, and accessibility. Local residents often are issued free-use permits for firewood, if the BLM is assured that there are no conflicts in the area in which they wish to obtain the dead and down wood. In the years 1969 and 1970, free-use permits for Christmas trees (500 per year) were issued for pinyon pine or juniper in the Big Wash/Chloride drainage. This practice was discontinued in 1971. Local stockmen infrequently cut fence posts for their individual use.

The woodland species are important as they contribute to the aesthetics of open space and constitute one of nature's finest processes for restoring oxygen to the atmosphere.

(2) Other Vegetative Products. The Joshua tree is one of the few tree species in the Mohave Desert. A very fine stand of this unique species is located generally at the northern tip of the Cerbat Mountains and spreads northeasterly for approximately 20 miles to the slopes of the Grand Wash Cliffs.

The Joshua tree is chiefly valuable for its contribution to the aesthetics of the surrounding desert environment. It is also a desirable species for transplanting for landscape purposes. However, BLM does not sell or allow plants to be taken for this purpose.

Except for plants used for landscaping, the Mohave Yucca is the only known plant desirable for commercial harvest. The plant grows extensively within the ES area and is presently harvested for commercial purposes on a limited basis as shown in Figure II-20. Little is known about the growth rate and reproductive processes, and consequently, it is not known whether it could be harvested on a sustained yield basis. Yucca schidigera is aesthetically pleasing and contributes quite extensively to the natural awareness of the desert environment.

g. Transportation Network

(1) Roads. The principal access to the ES study area is via three highways: Old U.S. 66, Interstate 40, and U.S. Highway 93 (see Figure II-20). I-40, a major east-west transcontinental route, forms the southern boundary of the unit. U.S. 93 links Phoenix and Las Vegas through Kingman and the center of the planning unit. This highway provides much of the exposure outsiders receive of the region through sightseeing opportunities and access to lateral roads within the ES area.

Arizona Highway 68 provides access through the Black Mountains from Kingman to Davis Dam and Bullhead City at the head of Lake Mohave. Additional access to the Black Mountains is via the Oatman Road which links the historic mining region of Oatman to Kingman and communities along the Colorado River. A third road, Cottonwood Road, crosses these mountains and connects U.S. 93 with Lake Mead National Recreation Area and Lake Mohave.

Arizona Highway 62 links Chloride with U.S. 93 at Grasshopper Junction. Big Wash Road leading from Chloride reaches the BLM campgrounds of Windy Point and Pack Saddle Mountain in the Cerbat Mountains. Further entrance to the Cerbat Mountains is via the Stockton Hill Road and its arteries on the east side of the range.

Pierce Ferry and Temple Bar, access points on Lake Mead, are linked to U.S. 93 by the Dolan Springs Road and the Temple Bar Road, respectively. Both paved roads cross the ES area.

An improved dirt road off of the Dolan Springs Road north of Red Lake proceeds to Hackberry, on U.S. 66, skirting the Grand Wash Cliffs. Numerous mining and ranch roads also branch off of the above major arteries and allow access by ORVs to the mountain foothills and the valley basins. Off-road travel in the mountain terrain is restricted by rugged topography. BLM lands in the planning area are extensive enough that most roads are open to the public.

Within Mohave County there are 413 miles of state system roads. Of these, 134 miles are state-supported, 186 are part of the Federal highway system, and 93 miles are limited access interstate routes.

The county roads total 2585 miles. It is a relatively large network which requires extensive investment in terms of maintenance and paving operations. At present, 1006 miles of this road network are part of a proposed county road system that will receive primary attention in terms of maintenance and upgrading. The breakdown of this system is as follows:

- Major county highways - 331.73 miles
- Minor county highways - 436.54 miles
- Arterial streets - 161.75 miles
- Collector streets - 76.33

The existing county roads were developed to meet the needs of miners, ranchers, and other nonurban residents located significant distances from urban areas and the more frequently utilized rights-of-way. This network has been difficult to maintain and at present has portions which are in substandard conditions.

(2) Bus Service. Within Mohave County there are four interstate bus firms: Greyhound, Continental Trailways, Las Vegas-Tonopha-Reno (LTR) Stageline, and Sun Valley. All lines except Sun Valley stop in Kingman. Greyhound and Continental use Old U.S. 66, I-40, and U.S. 93; LTR uses U.S. 93, and Sun Valley uses the three U.S. highways.

(3) Rail System. Mohave County is served by a main line of the Santa Fe Railroad connecting the southwestern United States with the Midwest. An average of 30 trains pass through the county per day. Kingman is the only community in the county where stops are made for passengers (by Amtrak) and freight. The route location is shown in Figure II-20.

(4) Aviation. There are a total of six airports in the county, four of which are in the ES area.

## 8. Natural Hazards

### a. Flooding

Floods within the ES area are caused by three types of storms: thunderstorms, tropical storms, and Pacific frontal systems or winter storms. Each storm type produces a different precipitation pattern, as discussed below.

While the average annual precipitation from these storms is relatively low in the ES area, the intensity and short duration typical of them create a threat of flooding.

The storm discharges result in two types of flooding in the ES area: riverine, in which defined watercourses overflow their banks, and overland, which is sheet-type flooding not contained within a defined watercourse.

- Thunderstorms in the ES area usually occur in the summer months -- July, August, and September -- and are relatively small in size (storm area) and produce local, short duration flooding. While maximum surface and river flows may be severe near the center of the storm, they decrease in severity downstream primarily because of the small volume of floodwater produced and the porosity of the streambeds and soil types in the foothills and mountain areas.

The valley soils, as described in subsection 3, often exhibit a moderately slow rate of infiltration (0.2-0.6 inches/hour). It is not uncommon for summer thunderstorms to release as much as a half inch of rain in 10-15 minutes. At this release rate, infiltration would only be 0.03-0.13 inches, hence resulting in heavy runoff.

- Tropical storms result from Pacific tropical hurricanes. These storms occur in the late summer or early fall months and usually produce less flooding on small streams than thunderstorms, but cause greater flooding on streams with drainage areas exceeding 50-100 square miles. The ES area experienced the most recent of this type of storm in August 1977, resulting in serious flooding in the Bullhead City area.

- Pacific frontal systems are often referred to as general winter storms. These storms may produce heavy precipitation over a large area and for extended periods of time. Flooding from these systems is generally the result of a series of this type of storm.

The topography, soil types, and vegetation characteristics of the ES area are the factors determining the degree of flood potential for the area. The potential flood hazard areas are the Detrital Wash and the network of washes in Hualapai Valley that includes the Truxton and Hualapai washes. (See also Table II-5.)

Shallow, overland flooding can be expected to occur in all of the topographically flat areas in the ES area. The depth of flooding is, however, generally less than six inches, infrequent, and does not cover extensive surface area. The course of this type of flood varies considerably, and is dependent on climatic conditions. The vicinity of Red Lake is one of the principal areas where such floods occur. While sheetfloods rarely fill the area to present an actual hazard, they will cause the lake to become a nearly impassable morass of mud.

USGS data at seven permanent water gauging stations in the ES area shown in Figure II-27 depict a great deal of variance in streamflow for the years 1963-1975. There were 63 recorded peak water discharges at seven gauging stations on seven main washes in the ES area as shown in Table II-41. These seven washes have a combined contributing drainage area of just over 1204 square miles. Figure II-27 shows that 48 of the peak water discharges in these washes came in the summer months of July, August, and September. The remaining 15 peak recordings were made during the fall and winter months.

The flood magnitudes, in cubic feet per second, for the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals are given in Table II-42. This table also indicates the area of the watershed in square miles.

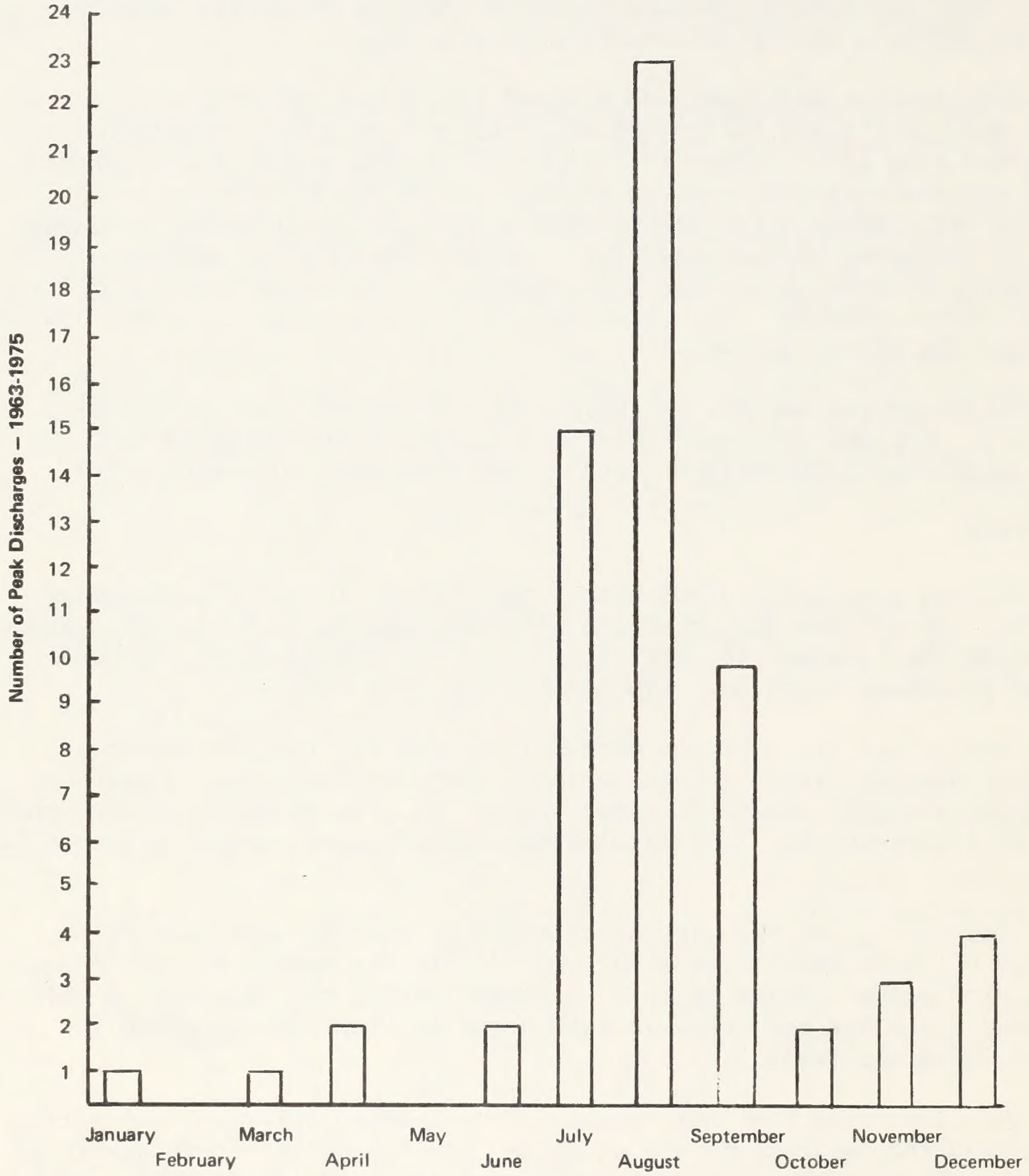
b. Fire

Fire as a natural hazard within the ES area is not a significant problem. Though the BLM retains a fire-fighting cadre during the summer months at the Kingman area office, its role is one of rapid, initial attack on grass, shrub, and timber fires as they occur.

These crews are equipped with helicopters for rapid movement to reported blazes. In an initial attack, their objective is to put out the fire before it becomes a large blaze. If this is not possible, the crew will contain the blaze until other crews arrive, and then return to base.

Since 1973, the fire crews stationed at Kingman have handled an average of 25-30 small blazes per year within the entire Kingman Resource Area, with maybe a third of them occurring within the ES area. A majority of these fires has been between 1-10 acres in size and are shown in Figure II-28 and Table II-43.

The fires have been more prevalent in summers following wet springs which resulted in an abundance of annual plant material being available as fuel. Many of these fires have been of the roadside variety. Areas of pinyon-juniper are also susceptible to fire, particularly where understories of brush are accumulated.




**Source:** U.S. Geological Survey records.

FIGURE II-27 PEAK FLOOD DISCHARGES BY MONTH

TABLE II-41

ANNUAL PEAK DISCHARGE OF SEVEN STATIONS IN ES AREA

| Water Year | Annual Peak Discharge (cfs) | Date | Gauge Height of Annual Peak (feet) |
|---|---|---|---|
| Truxton Wash at Valentine, Station 09404340 | | | |
| 1964 | 49,000 | 7-30-04 | – |
| 1965 | 250 | 7-29-65 | 3.75 |
| 1966 | 1,960 | 8-18-66 | 6.02 |
| 1967 | 1,640 | 9-15-67 | 5.75 |
| 1968 | 8,760 | 8-04-68 | 9.90 |
| 1969 | 900 | 7-19-69 | 5.33 |
| 1970 | 2,650 | 7-22-70 | 6.72 |
| 1971 | 1,130 | 8-21-71 | 5.55 |
| 1972 | 40 | 9-19-72 | 3.70 |
| 1973 | 380 | 7-08-73 | 4.63 |
| 1974 | 6,500 | 7-20-74 | 8.95 |
| 1975 | 1,400 | – | 5.80 |
| Valentine Wash at Valentine, Station 09404350 | | | |
| 1963 | 0 | – | – |
| 1964 | 5 | 8-64 | 2.35 |
| 1965 | 20 | 10-17-64 | 2.96 |
| 1966 | 4 | 12-09-65 | 1.98 |
| 1967 | 3,800 | 8-20-67 | 8.50 |
| 1968 | 50 | 8-04-68 | 2.93 |
| 1969 | 2 | 7-29-69 | 2.60 |
| 1970 | 30 | 7-70 | 2.75 |
| 1971 | 15 | 8-10-71 | 2.60 |
| 1972 | 2,800 | 8-12-72 | 8.90 |
| 1973 | 25 | 3-12-73 | 2.33 |
| 1974 | 0 | – | – |
| 1975 | 1 | – | – |
| Detrital Wash Tributary Near Chloride, Station 09419590 | | | |
| 1963 | 25 | 9-17-63 | 2.17 |
| 1964 | 50 | 8-12-64 | 2.29 |
| 1965 | 0.2 | 4-03-65 | – |
| 1966 | 73 | 8-16-66 | 2.49 |
| 1967 | 117 | 9-67 | 2.87 |
| 1968 | 20 | 8-68 | 1.54 |
| 1969 | 42 | 7-27-69 | 2.29 |
| 1970 | 0 | – | – |
| 1971 | 470 | 8-12-71 | 4.75 |
| 1972 | 92 | 9-19-72 | 2.64 |
| 1973 | 0 | – | – |
| 1974 | 46 | 7-21-74 | 2.19 |
| 1975 | 0 | – | – |

TABLE II-41 (Continued)

| Water Year | Annual Peak Discharge (cfs) | Date | Gauge Height of Annual Peak (feet) |
|---|---|---|---|
| Little Meadow Creek near Oatman, Station 09423760 | | | |
| 1965 | 10 | 4-03-65 | 2.93 |
| 1966 | 20 | 12-09-65 | 4.27 |
| 1967 | 0.5 | 8-06-67 | – |
| 1968 | 0 | – | – |
| 1969 | 0 | – | – |
| 1970 | 869 | 8-70 | 6.89 |
| 1971 | 50 | 8-12-71 | 4.26 |
| 1972 | 50 | 9-72 | 4.14 |
| 1973 | 600 | 11-72 | 6.13 |
| 1974 | 182 | 7-19-74 | 5.02 |
| 1975 | 0 | – | – |
| Sacramento Wash Tributary near Topock, Station 09423900 | | | |
| 1963 | 70 | 8-63 | 2.52 |
| 1964 | 128 | 7-26-64 | 3.01 |
| 1965 | 10 | 8-10-65 | 2.04 |
| 1966 | 20 | 12-09-65 | 2.55 |
| 1967 | 0 | – | – |
| 1968 | 10 | 11-21-67 | 1.92 |
| 1969 | 430 | 7-17-69 | 3.82 |
| 1970 | 15 | 8-70 | 2.75 |
| 1971 | 320 | 8-71 | 3.51 |
| 1972 | 500 | – | – |
| 1973 | 240 | 10-72 | – |
| 1974 | 1 | 1-74 | – |
| 1975 | 0 | – | – |
| Walnut Creek near Kingman, Station 09423780 | | | |
| 1965 | 152 | 8-65 | 3.02 |
| 1966 | 288 | 7-20-66 | 3.89 |
| 1967 | 228 | – | 3.44 |
| 1968 | 289 | – | 3.71 |
| 1969 | 2 | 9-13-69 | 2.38 |
| 1970 | 290 | 8-15-70 | 3.83 |
| 1971 | 715 | 8-71 | 5.89 |
| 1972 | 235 | 6-06-72 | 3.53 |
| 1973 | 425 | – | 4.51 |
| 1974 | 360 | 9-74 | 4.18 |
| 1975 | 0 | – | – |
| Sacramento Wash near Yucca, Station 09423820 | | | |
| 1965 | 0 | – | – |
| 1966 | 2,060 | 12-09-65 | 6.40 |
| 1967 | 800 | 9-67 | 4.70 |
| 1968 | 520 | 7-68 | 4.23 |
| 1969 | 8,030 | 9-16-69 | 7.33 |
| 1970 | 3,000 | – | 6.00 |
| 1971 | 13,000 | 8-12-71 | 7.63 |
| 1972 | 3,010 | 6-72 | 5.59 |
| 1973 | 5,200 | 11-16-72 | 6.35 |
| 1974 | 4,260 | 7-19-74 | 6.75 |
| 1975 | 0 | – | – |

**Source:** U.S. Geological Survey records.

TABLE II-42

ANNUAL PEAK DISCHARGE OF FLOODS – ES STUDY AREA

| Station | Contributing Drainage Area (sq mi) | Cubic Feet per Second for Each Recurrence Interval Indicated in Years | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2 | 5 | 10 | 25 | 50 | 100 |
| 9404340 | 370.00 | 1,240.0 | 4,320.0 | 7,860.0 | 14,300.0 | 20,600.0 | 28,200.0 |
| 9404350 | 3.15 | 10.0 | 195.0 | 904.0 | 4,520.0 | 12,600.0 | 31,400.0 |
| 9419590 | 1.23 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| 9423760 | 8.47 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| 9423780 | 31.30 | 258.0 | 410.0 | 520.0 | 666.0 | 781.0 | 899.0 |
| 9423820 | 787.00 | 2,390.0 | 5,610.0 | 8,770.0 | 14,100.0 | 19,200.0 | 25,300.0 |
| 9423900 | 14.70 | 41.0 | 182.0 | 399.0 | 920.0 | 1,580.0 | 2,570.0 |

**Source:** U.S. Geological Survey records.

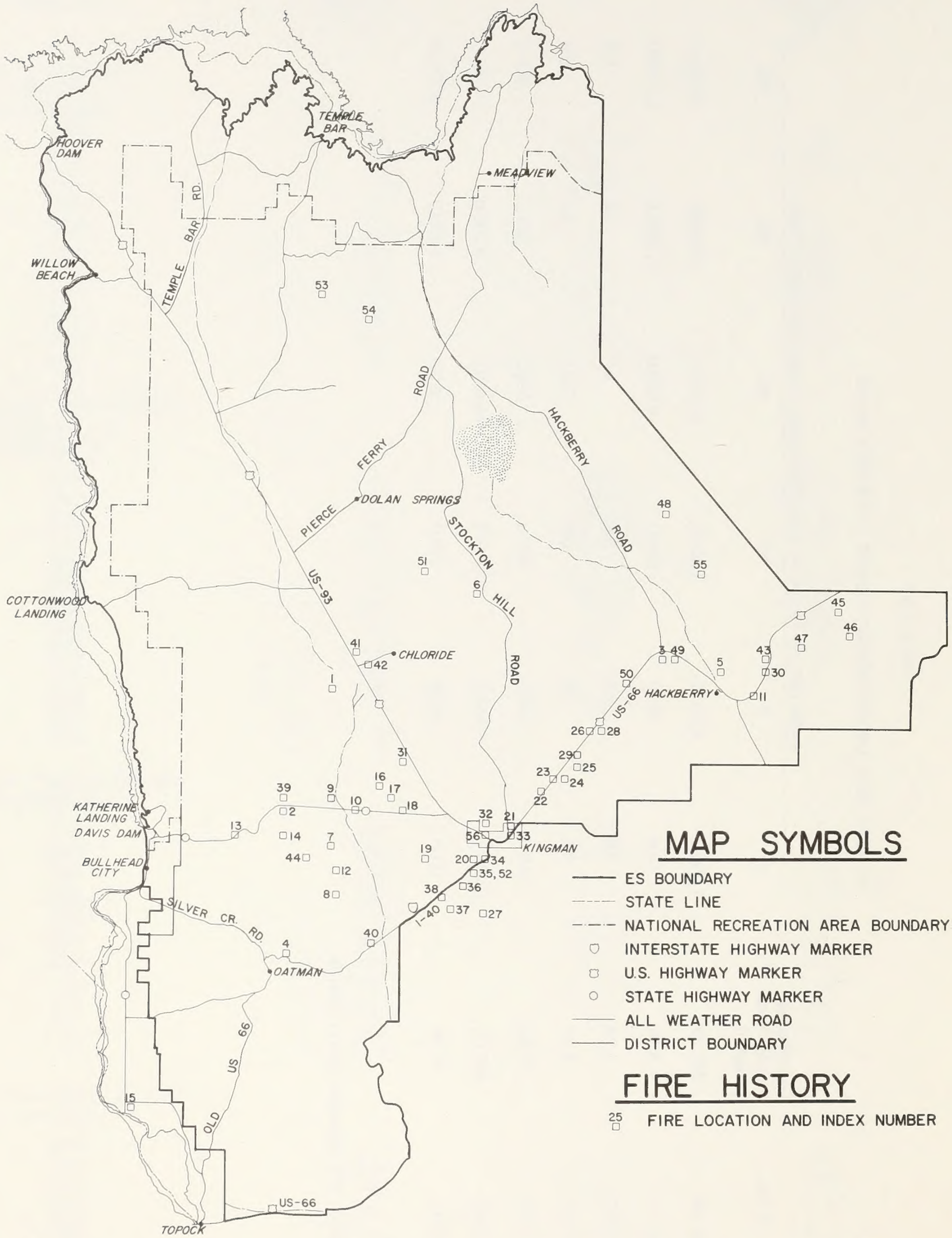



**FIGURE II-28 HISTORICAL FIRE LOCATIONS**

TABLE II-43

HISTORICAL FIRE INCIDENCE – ES STUDY AREA

**Acreage Code:** A = 0-0.25 | B = 0.26-9.0 | C = 10-99 | D = 100-299 | E = 300-999 | F = 1,000-4,999

**Cause Code:** M = Man-caused | L = Lightning

| No. | Year | Cause | Acres |
|---|---|---|---|
| 1 | 1967 | L | B |
| 2 | 1967 | L | B |
| 3 | 1967 | M | A |
| 4 | 1969 | M | C |
| 5 | 1972 | M | B |
| 6 | 1972 | M | C |
| 7 | 1973 | M | A |
| 8 | 1973 | M | A |
| 9 | 1973 | M | A |
| 10 | 1973 | M | A |
| 11 | 1973 | M | A |
| 12 | 1973 | M | B |
| 13 | 1973 | M | A |
| 14 | 1973 | L | C |
| 15 | 1973 | M | A |
| 16 | 1973 | L | A |
| 17 | 1973 | L | B |
| 18 | 1973 | L | A |
| 19 | 1973 | L | B |
| 20 | 1973 | M | A |
| 21 | 1973 | M | C |
| 22 | 1973 | M | B |
| 23 | 1973 | M | A |
| 24 | 1973 | M | B |
| 25 | 1973 | M | A |
| 26 | 1973 | M | A |
| 27 | 1973 | L | B |
| 28 | 1974 | M | A |
| 29 | 1974 | M | A |
| 30 | 1974 | M | A |
| 31 | 1974 | M | A |
| 32 | 1974 | M | B |
| 33 | 1974 | M | B |
| 34 | 1974 | M | A |
| 35 | 1974 | M | B |
| 36 | 1974 | M | B |
| 37 | 1974 | M | A |
| 38 | 1974 | M | A |
| 39 | 1974 | M | B |
| 40 | 1974 | M | A |
| 41 | 1974 | M | C |
| 42 | 1974 | M | C |
| 43 | 1975 | M | A |
| 44 | 1975 | M | A |
| 45 | 1976 | M | A |
| 46 | 1976 | L | A |
| 47 | 1976 | M | A |
| 48 | 1976 | M | A |
| 49 | 1976 | M | A |
| 50 | 1976 | M | A |
| 51 | 1976 | M | B |
| 52 | 1976 | M | B |
| 53 | 1977 | L | E |
| 54 | 1977 | L | B |
| 55 | 1977 | L | B |
| 56 | 1977 | L | A |

**Note:** See Figure II-28 for locations of fires.

**Source:** BLM Fire Chief, Kingman office.

c. Other Limiting Physical Factors and Hazards

(1) Steep Slopes (landslide areas). The three major mountain chains within the ES area (the Cerbats, Blacks, and Musics) all have an abundance of steep slopes which restrict intensive development and human activities. No active landslide areas are known.

(2) Dust Storms (see also subsection 1). The area immediately northeast of Kingman is subject to intermittent dust storms, primarily due to overgrazing of private land in the area. The dust-prone region as a whole comprises much of the lower portion of the Hualapai Valley. These dusty conditions have been so bad, on occasion, on U.S. Highway 66 as to hinder traffic.

Red Lake has a great amount of soil movement during dry, windy weather conditions, as numerous low dunes ring the lake, particularly to the east and south.

(3) Seismic Dangers. No unusual earthquake dangers are known.

9. Cultural Resources

a. Sources of Data

Compared with study undertaken elsewhere in Arizona, only a moderate amount of archaeological research has been done in the ES area. To date, this research has consisted primarily of unsystematic site surveys and a limited amount of excavation. The lack of intensive and systematic research has made it difficult to establish statistically valid inferences about the cultural resources of the ES area.

This description of the cultural resources of the ES area is derived primarily from four sources:

- Archaeological site records on file at institutions in Nevada, California, and Arizona,
- Published and unpublished manuscripts relating to the prehistoric and historic resources of the ES area and surrounding regions,
- Personal communication with researchers who have worked in the area, and
- The stratified random sample survey (Class 2 Cultural Resource Inventory) conducted by the Bureau of Land Management.*

The BLM survey was the principal source of data used because it was amenable to statistical manipulation and provided the best geographic coverage of the ES area (see Figure II-29 for the distribution of sample units). The composition of vegetative strata on which the sample was based is shown in Table II-44 and the relative areas encompassed by these strata are shown in Table II-45. The BLM survey was used to derive distributional patterns and site types of prehistoric cultural resources, condition of cultural resources, and areas of critical concern for cultural resource values. The sample was also used to infer the number of prehistoric sites likely to exist in the ES area, although the relatively small sample size resulted in estimates that were not very precise. Information from a search of site records and pertinent literature was used to define areas of historic cultural resources, to determine the significant gaps in understanding of past human use of the ES area, and to support inferences made on the basis of the BLM Cultural Resource Inventory.

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*Christine L. Kincaid, Cerbat-Black Mountains Research/Sampling Design, unpublished manuscript, on file, Bureau of Land Management, Phoenix District Office, 1976.

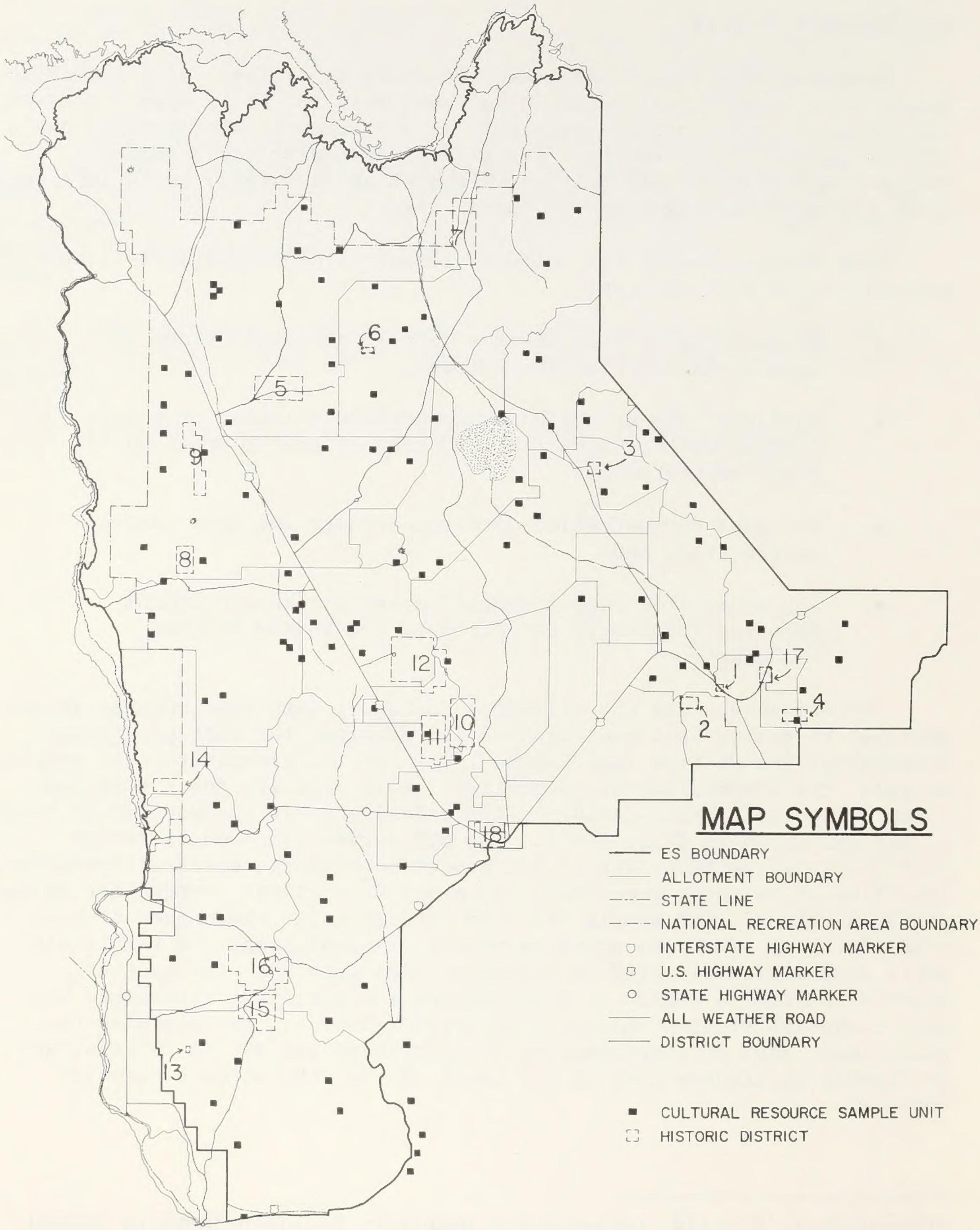


FIGURE II-29 CULTURAL RESOURCE SITES AND HISTORICAL LOCATIONS

TABLE II-44

VEGETATION STRATA - ACREAGE BY PLANNING UNITS

| Vegetation Stratum | Planning Unit Acreage* (all land statuses) | Total Percent of Planning Unit Acreage | Acreage of BLM-administered Lands* | Total Percent of BLM-administered Acreage |
|---|---|---|---|---|
| Black Mountains** | | | | |
| A1 | 409,143 | 52.4% | 245,120 | 45.9% |
| A2 | 358,981 | 46.0 | 280,000 | 52.5 |
| A3 | 1,350 | 0.2 | 320 | 0.0 |
| A4 | 10,420 | 1.3 | 8,000 | 1.5 |
| Total | 779,894 | 99.9% | 533,440 | 99.9% |
| Cerbat Mountains | | | | |
| A1 | 259,760 | 21.3% | 197,672 | 31.3% |
| A2 | 581,434 | 47.6 | 250,718 | 39.6 |
| A3 | 258,920 | 21.2 | 145,445 | 23.0 |
| A4 | 109,040 | 8.9 | 31,769 | 5.0 |
| A5 (barren) | 12,160 | 1.0 | 6,773 | 1.1 |
| Total | 1,221,314 | 100.0% | 632,377 | 100.0% |

*Acreage does not include portions of Peacock Mountain and West Peacock allotments south of planning unit boundary; acreage includes portions of Borianna, Happy Jack, and Lazy Yu allotments within the Cerbat/Black Mountain Planning Units.
**Acreage of BLM-administered lands in the Black Mountain Planning Unit estimated from BLM land status maps.

Source: BLM Class 2 Cultural Resource Inventory.

TABLE II-45

COMPOSITION OF VEGETATION STRATA IN TERMS OF
BLM RANGE TYPES AND NATURAL VEGETATION CLASSIFICATION

| Vegetation Stratum | BLM Range Type | | Natural Vegetation Classification* Corresponding to BLM Range Types | | |
|---|---|---|---|---|---|
| | Name | No. | Formation | Biome | Community |
| A1 | Creosote Bush | 11 | Desertscrub | Mohave Desertscrub | Creosote Bush |
| | Mesquite | 12 | | Sonoran Desertscrub | Riparian Desertscrub |
| | Saltbush | 13 | | Mohave Desertscrub | Saltbush and Shadscale |
| | Winterfat | 15 | | Mohave Desertscrub | Winter Fat |
| A2 | Desertscrub | 16 | Desertscrub | Mohave Desertscrub | Riparian Desertscrub |
| | | | | Mohave Desertscrub | Joshua Tree |
| | | | | Mohave Desertscrub | Blackbrush |
| | | | | Sonoran Desertscrub | Riparian Desertscrub |
| | Half-shrub | 17 | Grassland | Desert Grassland | Shrub-Grassland Scrub Disclimax |
| | | | | Plains Grassland | Shrub-Grassland Disclimax |
| A3 | Pinyon-Juniper | 9 | Woodland | | Pinyon-Juniper |
| | Mountain Shrub | 5 | Scrubland | | Evergreen Sclerophyll |
| | Conifer | 6 | Forest | | Pine |
| A4 | Grass | 1 | Grassland | Plains Grassland | Shrub-Grassland Disclimax |
| | | | | Plains Grassland | Galleta-Tobosa |
| | | | | Plains Grassland | Grama |
| | | | | Plains Grassland | Mixed Grass |
| | | | | Desert Grassland | Tobosa and Galleta Grass Scrub |
| | | | | Desert Grassland | Grama Grass Scrub |
| | | | | Desert Grassland | Mixed Grass Scrub |
| | | | | Desert Grassland | Sacaton Grass Scrub |
| | | | | Desert Grassland | Bear Grass Scrub |
| | | | | Desert Grassland | Shrub-Grass Scrub Disclimax |
| | Sagebrush | 4 | Desertscrub | Mohave Desertscrub | Sagebrush-Great Basin Desertscrub-like Communities |
| A5 | Barren (not sampled) | 8 | | | |

*After Brown and Lowe.

Source: Museum of Northern Arizona.

b. Culture History of the ES Area

Native Americans have occupied the ES area since at least 250 BC.* Their occupation may extend as far into the past as 12,000 years ago. By contrast, the use of the area by European-Americans is a relatively recent occurrence, dating to the 17th century. A summary of the area's cultural history and its relationship to the significance of cultural resources of the area is presented in Appendix G.

c. Cultural Resources of the ES Area

(1) Prehistoric Cultural Resources

- Population Estimates

The total number of prehistoric sites on public lands in the Cerbat Planning Unit is estimated at between 1561 and 2224 (60% confidence limits) with the most likely figure 1912. In the Black Mountain Planning Unit the number of sites on public lands is probably about 2692 with the true number falling between 2007 and 3426 (60% confidence limits). In very rough terms, this means that there are approximately two sites per square mile in the Cerbat unit and two to three sites per square mile in the Black Mountain unit. There is insufficient data to estimate total numbers of sites in the Lake Mead National Recreation Area portion of the ES area.

- Distribution of Prehistoric Cultural Resources

Five hundred four prehistoric sites have been located throughout the ES area (Table II-46). They are most concentrated above the Grand Wash Cliffs and on the west slopes of the Cerbat and Black mountains. The cultural resources of the valley floors and the east flanks of the mountains are relatively sparse.

Analysis of the principal environmental components associated with prehistoric site locations suggest that in the Cerbat unit, pinyon-juniper woodland is the most effective predictor of the presence of archaeological sites. In the Black Mountain unit, the single most efficient predictor of site locations is physiographic diversity. That is, most sites are located in areas with a wide range of topographic features. These areas, which appear to correlate with mountain foothills and bajada slopes, may have been associated in the past with areas of vegetative diversity which provided substantial opportunity for collecting wild plant foods.

Archaeological resources also tend to be located near water sources. Table II-47 shows that approximately half of all known and locatable sites are found within one mile of a water source. Springs in particular are good predictors of site location. Statistically, there are approximately two to three times more sites located within a one-mile radius of a spring than would be expected based on the amount of area within that circle.

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*C. Vance Haynes, Geochronology of Man-Mammoth Sites and Their Bearing on the Origin of the Llano Complex, University of Kansas Press, Lawrence, 1970.

TABLE II-46

DISTRIBUTION OF RECORDED SITES BY ALLOTMENT

| Allotment | Number of Recorded Sites | Allotment | Number of Recorded Sites |
|---|---|---|---|
| Big Ranch | 146 | Jones Spring | 0 |
| Black Mountain | 40 | Long Mountain | 1 |
| Cane Springs | 8 | Mineral Park | 10 |
| Canyon Ranch | 34 | Mt. Tipton | 0 |
| Castle Rock | 5 | Mud Springs | 2 |
| Cedar Canyon | 2 | Music Mountains | 10 |
| CQT | 5 | Peacock Mountain* | 3 |
| Clay Springs | 1 | Pine Springs | 1 |
| Cook Canyon | 3 | Portland Spring | 12 |
| Crozier Canyon | 14 | Private (Kingman) | 7 |
| Curtain | 1 | Silver Creek | 117 |
| Dolan Springs | 6 | Stockton Hill | 0 |
| Diamond Bar/Gold Basin | 17 | Thumb Butte | 16 |
| Feldspar | 2 | Truxton Canyon | 2 |
| Fort McEwen | 1 | Upper Music Mountain | 1 |
| Gediondia | 5 | Valentine | 1 |
| Hackberry | 2 | West Peacock* | 0 |
| Hualapai Ranch | 0 | Wildlife Reserve | 29 |
| Total | 292 | Total | 212 |

*Includes portions of allotments within Cerbat Mountain Planning Unit only.

Source: Museum of Northern Arizona.

TABLE II-47

DISTRIBUTION OF CULTURAL RESOURCES* BY WATER SOURCE
(percent of sites)

| | Distance from | |
|---|---|---|
| Distance | Spring | Permanent, Intermittent, Ephemeral Stream |
| 0-¼ Mile | 7.9% | 32.6% |
| ¼-½ Mile | 7.3 | 0 |
| ½-1 Mile | 4.9 | 0.001 |
| 1-2 Miles | 6.4 | 0.001 |
| 2 Miles + | 39.8 | 0 |

*All 504 locatable prehistoric sites.

Source: Table II-46, Museum of Northern Arizona.

Individual site types also show preference for certain environmental settings. The distribution of site types by vegetative strata (Table II-48) is discussed below and the distribution of site types by allotment is shown in Table II-49.

- Prehistoric Site Types

Based on site features, presence of ceramics, and presence of ground and chipped stone, a computer analysis isolated seven principal types of prehistoric cultural resources in the Cerbat/Black Mountain Planning Units:

- Food Processing Stations. Areas where wild plants and animals are harvested or prepared; characteristics of the artifact assemblage are grinding stones and bifacial tools.

- Base Camps. Living sites of a permanent or semi-permanent nature; sites are characterized by a wide variety of artifactual debris and generally cover areas in excess of 1000 square meters; they may contain evidence of several of the activities occurring on other types of sites.

- Stone Tool Manufacturing Sites. Areas where tools made of suitable raw material were produced; typical artifactual remains include cores and unmodified thinning flakes.

- Small Campsites with Ceramics. Areas which were probably overnight camps which are typified by a limited amount of ceramic and stone debris.

- Temporary Camps. Areas believed to represent living sites with a relatively short occupation span, probably seasonal; artifacts include a variety of chipped stone tools, ceramics, and groundstone covering a more limited area than base camps.

- "Pot Drops". Areas containing remains of a single broken vessel.

- Rock Alignments. Rocks placed end to end in a variety of geometric and anthropomorphic patterns; many of these may represent the foundations of temporary shelters.

Base camps are further divided into two types. Type II differs from type I in that type II also contains trade-ware ceramics and projectile points. Type II base camps are also somewhat larger than type I sites.

In the Lake Mead National Recreation Area portion of the ES area, inspection of site records indicates two principal site types occurring north of Boulder Dam. These consist of rock shelter sites of uncertain age (in general, they appear to be early, preceramic) and small temporary camps located where the washes drain into the Colorado River. South of

## TABLE II-48

### DISTRIBUTION OF SITE TYPES BY VEGETATION STRATA

| | Site Types | | | | | | |
|---|---|---|---|---|---|---|---|
| **Vegetation Strata** | Food Processing | Base Camp | Stone Tool Manufacturing | Temporary Camp | Ceramic Camp | 'Pot Drop' | Rock Alignment |
| Cerbat Mountains | | | | | | | |
| A1 | 3 | 2 | 0 | 1 | 0 | 0 | 0 |
| A2 | 0 | 0 | 0 | 5 | 1 | 1 | 0 |
| A3 | 1 | 7 | 0 | 7 | 2 | 0 | 0 |
| A4 | 0 | 3 | 3 | 3 | 0 | 0 | 0 |
| Black Mountains | | | | | | | |
| A1 | 7 | 0 | 6 | 3 | 0 | 0 | 2 |
| A2 | 5 | 3 | 0 | 2 | 2 | 0 | 0 |
| A3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| A4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Source:** BLM Class 2 Cultural Resource Inventory.

## TABLE II-49

### DISTRIBUTION OF SITE TYPES BY ALLOTMENT

| | Site Types | | | | | | |
|---|---|---|---|---|---|---|---|
| **Allotment*** | Food Processing | Base Camp I | Base Camp II | Stone Tool Manufacturing | Temporary Camp | Ceramic Camp | 'Pot Drop' |
| Big Ranch | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Black Mountain | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| Cane Springs | 3 | 1 | 0 | 0 | 0 | 1 | 0 |
| Castle Rock | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Cerbat/ Quail Springs/ Turkey Track | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| Cedar Canyon | 0 | 2 | 0 | 0 | 1 | 0 | 0 |
| Diamond Bar/ Gold Basin | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Crozier Canyon | 1 | 1 | 1 | 0 | 2 | 0 | 0 |
| Dolan Springs | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Gediondia | 4 | 0 | 0 | 0 | 0 | 1 | 0 |
| Mineral Park | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Music Mountain | 0 | 1 | 1 | 3 | 3 | 0 | 0 |
| Silver Creek | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Truxton | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Upper Music | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Valentine | 0 | 0 | 3 | 0 | 3 | 0 | 0 |

*Only allotments containing Class 2 inventory sites listed.

**Source:** BLM Class 2 Cultural Resource Inventory.

Boulder Dam, there appear to be three major types of sites along the river: agricultural sites located on, or directly above, the Colorado River floodplain, stone tool manufacturing sites located where water-worn river cobbles are abundant and accessible for modification into tools, and small plant processing stations located adjacent to mesquite bosques. The latter type of site most likely reflects mesquite bean use by riverine communities during years when crops were poor.

- Distribution of Prehistoric Site Types

Eighty percent of all base camps and 76% of all temporary camps are found in the Cerbat Mountain Planning Unit. Six of nine (67%) stone tool manufacturing sites and 12 of 16 (75%) of food processing sites are in the Black Mountain unit. Other site types are more evenly distributed between the two planning units (see Table II-49).

Fifteen of 16 food processing sites are located in strata A1 and A2, predominantly Mohave and Sonoran Desertscrub biomes typical of lower elevations. The largest category of base camps is strata A3 (Table II-48), composed of pinyon-juniper and mountain shrub communities. All nine of the tool manufacturing sites are located in allotments where raw material is available -- Music Mountain and Silver Creek. In the latter area, cobbles in the desert pavement probably provided stone tool source material.

(2) Historic Cultural Resources. Eighteen historic areas have been identified in the ES area (Figure II-29 and Table II-50). Of these, 16 are related to mining and reflect the importance of this activity in the development of the region. There are four primary locales for mining resources -- the Peacock and Music Mountain/Grand Wash Cliffs area, the White Hills/Lost Basin area at the north end of the Cerbat Mountains, the west slopes of the Cerbat Mountains, and the west slopes of the Black Mountains extending to the Colorado River. The first 16 represent abandoned mines, mining camps, former communities of Chinese and native Americans living in mining settlements, and cemeteries connected with them.

The Kingman historic district, on the other hand, represents an early settlement centered around the railroad and around mining and cattle-related commerce. It also contains an example of a military encampment, Camp Beale's Spring. The Valentine historic district also represents an early administrative center, site of the first Bureau of Indian Affairs agency to the Hualapai, and the first school for Hualapai children.

In addition to cultural resources related primarily to European-American settlement of the ES area, there are many sites identified as areas used by the Hualapai during the historic period.* These include base camps, temporary camps, burial/cremation areas, mining and military-related camps, seed gathering and food processing stations, and ranches,

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*Henry F. Dobyns, Hualapai Indians I, II, and III: Prehistoric Occupation Within the Eastern Area of the Yuman Complex, A Study in Applied Archaeology, Edited by David A. Harr, Garland Press, New York, 1974.

TABLE II-50

HISTORIC DISTRICTS OF THE ES AREA - APPROXIMATE SIZE AND ALLOTMENT LOCATIONS

| District | | Area (acres) | Allotments Represented |
|---|---|---|---|
| 1. | Hackberry | 160 | Hackberry |
| 2. | Mine Spring | 960 | Peacock Mountain |
| 3. | Music Mountain Mine | 640 | Cane Springs, Cedar Canyon |
| 4. | Victoria Mine | 1,280 | Crozier Canyon, Valentine |
| 5. | White Hills | 5,120 | Big Ranch |
| 6. | Cyclopic | 320 | Diamond Bar/Gold Basin |
| 7. | King Tut Mine | 10,240 | Big Ranch, Diamond Bar/Gold Basin |
| 8. | Dixie Queen Mine | 1,920 | Big Ranch |
| 9. | Mohave Mine | 3,520 | Big Ranch |
| 10. | Stockton | 13,480 | Pine Springs, Stockton Hill, Canyon Ranch, Mineral Park |
| 11. | Golconda | 4,480 | Mineral Park, Pine Springs |
| 12. | Chloride | 10,080 | Canyon Ranch, Mineral Park, CQT |
| 13. | Milltown | 160 | Wildlife Reserve |
| 14. | Katherine | 1,600 | Thumb Butte |
| 15. | Green Quartz Mine | 4,800 | Silver Creek, Wildlife Reserve |
| 16. | Oatman | 8,480 | Silver Creek |
| 17. | Valentine | 800 | Valentine |
| 18. | Kingman | 3,200 | Private, Cook Canyon |

Source: Museum of Northern Arizona.

TABLE II-51

FACTORS AFFECTING CONDITION OF CULTURAL RESOURCES* OF THE ES AREA

| | Erosion | Vandalism | Animal Activity | Construction/ Mining | ORV Traffic |
|---|---|---|---|---|---|
| Number of Sites | 159 | 10 | 20 | 21 | 19 |
| Percent | 77% | 5% | 10% | 10% | 9% |

*207 sites. Some sites have been affected by more than one type of deterioration. The above figures reflect the fact that a single site may be counted under more than one category.

Source: BLM Class 2 Cultural Resource Inventory and BLM-Lake Mead National Recreation Area Exchange Survey conducted by Nancy Curriden in 1977.

as well as a single known agricultural village and the site of the Hualapai ghost dances. Although some of these sites, notably at Camp Beale's Spring and White Hills, occur in the historic districts defined above, most are too dispersed over the landscape to fit discretely into additional geographically defined historic districts. Some of these sites, however, do fall into areas defined as critical for prehistoric cultural resources in f below.

d. Condition of Cultural Resources

The most significant environmental factor influencing the condition of cultural resources throughout the ES area is erosion. As shown in Table II-51, more than 75% of sites in a sample of 207 were damaged through the action of wind and water. Of this same sample 10% were damaged or destroyed by construction and mining-related activities, 10% were affected by rodents, wild horses, and domestic stock, and 9% were disturbed by ORV traffic. Another 5% were described as disturbed by vandalism. The overall condition of cultural resources in the ES area is fair.

All of these figures should be considered conservative estimates of the condition of cultural resources. Many of the factors affecting the quality of cultural resources are difficult to identify and it is likely that many more sites than those noted above have been disturbed, particularly by vandalism, animal use, both domestic and wild, and erosion. It is also probable that many sites along the Colorado River have been inundated since they were first recorded.

e. Significance of the Cultural Resources of the ES Area

(1) The Nature of Cultural Resource Values. Cultural resources are important because they provide information about the past that is unavailable from any other source. The sites in the ES area, although affected by erosion, vandalism, grazing, and construction, have the potential to increase our understanding of the ways in which prehistoric and historic populations used the ES area and how they adapted to its environmental conditions.

The principal categories of significance that apply to cultural resources are those of (a) scientific significance, (b) heritage value for native and European-Americans, and (c) recreational and educational potential. (See Appendix G for further discussion of significance.)

(2) National and State Registers. The State Register of Historic Sites is a listing of sites significant in local or regional history; the National Register of Historic Places lists sites of local, regional, and national significance. The National Register provides Federal protection (36CFR800); the State Register is an honorific listing only.

Two historic sites within the ES area, Camp Beale's Spring and the Bonelli House, are listed on, or nominated for, the National Register. Both are located within the Kingman historic district. Also within the Kingman district is the Red Schoolhouse, an historic site listed on the State Register of Historic Sites. No other sites are currently being considered for nomination to either register.

There is insufficient information in the existing site files to determine which sites are eligible to be nominated to the national or state register. Potential candidates include the Hualapai ghost dance camp, any Early Man sites in the Red Lake area, and some of the abandoned mines and mining towns, such as Oatman. Further investigation, in the field, is needed to determine if these or other sites are suitable for either register.

f. Areas of Critical Concern for Cultural Resources

(1) Definition of Critical Areas. Based on the overall distribution of cultural resources, the distribution of particular site types, the quantity of cultural resources, and their potential for scientific, heritage, and educational significance in the ES area, five critical areas have been defined. Four are areas of primarily prehistoric cultural resource values; one consists of historic districts. Some overlap occurs among these areas. Not all important sites (e.g., the Hualapai ghost dance camp) fall into these areas. These areas are, however, considered the most significant clusters of cultural resource for the reasons discussed below.

- Springs

Spring areas, as noted above, are areas of relatively dense cultural resources. They are likely to contain resources representative of a wide range of periods of occupation and types of activity. Because they occur in generally rocky and mountainous terrain, they have potential for containing rock shelters. The historic Hualapai agricultural site and base camps also occur in areas less than one mile from springs. Spring areas are defined as all land within one mile of a spring.

- Red Lake

This is the most likely locality in the ES area to contain evidence of Early Man occupation. Further, the area contains at least two sites representative of historic Hualapai seed gathering camps and may also contain additional sites significant in Hualapai heritage.

- Grand Wash Cliffs

This area is on the east edge of the ES area, at elevations above the 4000-foot contour line and contains large amounts of pinyon-juniper woodland. The cliffs area and the west slope of the Black Mountains both show generally higher site densities than the rest of the ES area, as indicated in Table II-52. Ceramic-bearing sites are common. Base camps, particularly type II base camps, are concentrated in this zone. Historic Hualapai base camps and at least one historic Hualapai agricultural village are also found in the Grand Wash Cliffs area. Proximity to the modern Hualapai reservation suggests that the area may contain additional sites of importance to the Hualapai.

- West Slope of the Black Mountains

Like the Grand Wash Cliffs, this zone contains relatively large numbers of archaeological remains (Table II-52). The sites are generally fragile surface materials which represent a range of site types and

TABLE II-52

DISTRIBUTION OF CULTURAL RESOURCES BY PHYSIOGRAPHIC UNIT

| | Grand Wash Cliffs | | Hualapai Valley | | Sacramento Valley | | Detrital Valley | | West Slope of the Black Mountains | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Percent | No. | Percent | No. | Percent | No. | Percent | No. | Percent |
| Total Quadrants | 20 | | 28 | | 23 | | 30 | | 25 | |
| Quadrants with 1 or More Sites | 12 | 60% | 4 | 14% | 6 | 26% | 3 | 10% | 8 | 32% |
| Quadrants with 4 or More Sites | 2 | 10 | 0 | 0 | 1 | 5 | 0 | 0 | 3 | 12 |

Source: BLM Class 2 Cultural Resource Inventory.

activities including stone tool manufacturing, temporary campsites, base camps, rock alignments, and food processing sites. The passes at the crest of the Black Mountains were used as travel routes by European explorers and surveyors. They have a high likelihood of containing sites with evidence of prehistoric and historic trade between riverine and upland areas and may also hold rock shelters with high potential for preserving perishables. Both the mountain slopes and the pass area could contain places of cultural importance to the modern Mohave.

- Historic Districts

The 18 identified historic areas within the ES area are representative of important developments in European-American settlement of the region including important mines, mining towns, early settlements, and administrative centers. The Kingman district contains the two National Register sites of the ES area. The White Hills district contains cultural remains of a Hualapai community and burial areas of both native and European-American miners which would be of cultural and religious importance to these groups. The single military-related Hualapai camp is located within the Kingman district. Other historic districts hold evidence of other ethnic groups that participated in the development and growth of the ES area. These areas represent the known sites of historic activity in the ES area. Their significance relative to one another and to other undocumented historic sites is not determinable from existing records.

(2) Distribution of Critical Areas. The five areas considered most critical for cultural resource values were measured and recorded for each allotment. The results are shown in Table II-53. Allotments were ranked for sensitivity to critical areas with two sets of ranks, the raw rank and the adjusted rank. The raw rank represents the ordering of the allotments with respect to the total area of critical zones within each allotment. This figure reflects the relative likelihood that significant kinds and amounts of cultural resources will be found within the allotment. The raw rank measurement assures that small allotments, no matter how replete with cultural resources, will fall at the lower end of the ordering; the adjusted ranks compensate for allotment size by ranking allotments with respect to an index (I). I is computed by dividing the total critical area per allotment by the allotment area according to the following formula:

$$\text{Index of sensitivity (I)} = \frac{\text{Critical Area (CA)}}{\text{Allotment Area (A)}} \times 100$$

This index is an indication of the relative density of potential cultural resource with respect to the allotment or, alternatively, a measure of the likelihood of encountering cultural resources during implementation of the proposed action. The values for A, CA, I, and the raw and adjusted ranks are shown in Table II-54. In both sets of ranks, the allotment with rank 1 is considered most sensitive to critical cultural resource values; those with ranks of 30 or higher are least sensitive.

TABLE II-53

DISTRIBUTION OF AREAS CRITICAL TO CULTURAL RESOURCE VALUES BY ALLOTMENT
(areas approximate – in square miles)

| Allotment | Spring Areas | Red Lake | Grand Wash Cliffs | West Slope of the Black Mountains | Historic Districts |
|---|---|---|---|---|---|
| Big Ranch | 21.5 | 0 | 0 | 285.1 | 29.0 |
| Black Mountain | 44.1 | 0 | 0 | 6.5 | 0 |
| Cane Springs | 18.7 | 43.0 | 8.7 | 0 | 0.8 |
| Canyon Ranch | 21.3 | 0 | 0 | 0 | 3.5 |
| Castle Rock | 10.4 | 0 | 0 | 0 | 0 |
| Cedar Canyon | 15.5 | 16.4 | 4.9 | 0 | 0.3 |
| Cerbat/Quail Springs/ Turkey Track | 41.0 | 0 | 0 | 0 | 12.3 |
| Clay Springs | 2.7 | 0 | 9.4 | 0 | 0 |
| Cook Canyon | 3.5 | 0 | 0 | 0 | 1.5 |
| Crozier Canyon | 44.0 | 0 | 179.0 | 0 | 0.8 |
| Curtain | 0.2 | 0 | 0 | 0 | 0 |
| Diamond Bar/ Gold Basin | 66.9 | 0 | 90.1 | 0 | 4.0 |
| Dolan Springs | 17.2 | 0 | 0 | 0 | 0 |
| Feldspar | 0.4 | 0 | 0 | 0 | 0 |
| Ft. McEwen | 12.6 | 0 | 0 | 72.9 | 0 |
| Gediondia | 21.8 | 0 | 0 | 29.7 | 0 |
| Hackberry | 13.9 | 0 | 25.5 | 0 | 0.3 |
| Hualapai Ranch | 0 | 0 | 0 | 0 | 0 |
| Jones Spring | 0.9 | 0 | 0 | 0 | 0 |
| Long Mountain | 0 | 0 | 0 | 0 | 0 |
| Mineral Park | 13.4 | 0 | 0 | 0 | 17.3 |
| Mt. Tipton | 13.7 | 0 | 0 | 0 | 0 |
| Mud Springs | 16.2 | 0 | 0 | 0 | 0 |
| Music Mountain | 3.2 | 0 | 28.5 | 0 | 0 |
| Peacock Mountain | 3.7 | 0 | 0 | 0 | 1.5 |
| Pine Springs | 4.6 | 0 | 0 | 0 | 5.0 |
| Portland Spring | 3.7 | 0 | 0 | 64.5 | 0 |
| Private (Kingman) | 4.7 | 0 | 0 | 0 | 4.0 |
| Silver Creek | 24.3 | 0 | 0 | 143.6 | 16.3 |
| Stockton Hill | 5.4 | 0 | 0 | 0 | 4.0 |
| Thumb Butte | 15.2 | 0 | 0 | 52.9 | 2.5 |
| Truxton | 7.1 | 0 | 13.8 | 0 | 0 |
| Upper Music | 18.4 | 8.5 | 38.5 | 0 | 0 |
| Valentine | 0 | 0 | 7.8 | 0 | 2.5 |
| West Peacock | 3.3 | 0 | 0 | 0 | 0 |
| Wildlife Reserve | 3.5 | 0 | 0 | 165.3 | 4.8 |

**Source:** Museum of Northern Arizona.

TABLE II-54

ALLOTMENT RANKING BY AMOUNT OF AREA CRITICAL TO CULTURAL RESOURCE VALUES
(areas approximate — in square miles)

| Allotment | Total Allotment Area (A) | Critical Area (CA) | Raw Rank* | I ** | Adjusted Rank* |
|---|---|---|---|---|---|
| Big Ranch | 962 | 336 | 1.0 | 34.9 | 23.0 |
| Black Mountain | 184 | 51 | 13.0 | 27.7 | 25.5 |
| Cane Springs | 166 | 71 | 7.5 | 42.7 | 20.0 |
| Canyon Ranch | 90 | 25 | 18.0 | 27.7 | 25.5 |
| Castle Rock | 17 | 10 | 25.0 | 58.8 | 16.0 |
| Cedar Canyon | 138 | 37 | 15.0 | 26.8 | 27.0 |
| Cerbat/Quail Springs/ Turkey Track | 109 | 53 | 11.0 | 48.6 | 18.0 |
| Clay Springs | 20 | 12 | 23.0 | 60.0 | 15.0 |
| Cook Canyon | 12 | 5 | 29.5 | 41.6 | 24.0 |
| Crozier Canyon | 179 | 224 | 2.0 | 125.1 | 4.0 |
| Curtain | 6 | 0 | 34.5 | 0 | 34.5 |
| Diamond Bar/ Gold Basin | 386 | 161 | 5.0 | 41.7 | 21.0 |
| Dolan Springs | 114 | 17 | 20.0 | 14.9 | 30.0 |
| Feldspar | 7 | 0 | 34.5 | 0 | 34.5 |
| Ft. McEwen | 165 | 86 | 6.0 | 52.1 | 17.0 |
| Gediondia | 33 | 52 | 12.0 | 157.5 | 1.0 |
| Hackberry | 109 | 40 | 14.0 | 36.6 | 22.0 |
| Hualapai Ranch | 46 | 0 | 34.5 | 0 | 34.5 |
| Jones Spring | 26 | 1 | 32.0 | 3.8 | 31.0 |
| Long Mountain | 67 | 0 | 34.5 | 0 | 34.5 |
| Mineral Park | 28 | 31 | 17.0 | 110.7 | 7.0 |
| Mt. Tipton | 22 | 14 | 22.0 | 63.6 | 13.0 |
| Mud Springs | 84 | 16 | 21.0 | 19.0 | 29.0 |
| Music Mountain | 32 | 32 | 16.0 | 100.0 | 10.0 |
| Peacock Mountain | 23 | 5 | 29.5 | 21.7 | 28.0 |
| Pine Springs | 12 | 10 | 25.0 | 83.3 | 12.0 |
| Portland Spring | 65 | 68 | 9.0 | 104.6 | 9.0 |
| Private (Kingman) | 21 | 9 | 27.5 | 42.8 | 19.0 |
| Silver Creek | 145 | 184 | 3.0 | 126.8 | 3.0 |
| Stockton Hill | 6 | 9 | 27.5 | 150.0 | 2.0 |
| Thumb Butte | 57 | 71 | 7.5 | 124.5 | 5.0 |
| Truxton | 20 | 21 | 19.0 | 105.0 | 8.0 |
| Upper Music | 73 | 65 | 10.0 | 89.0 | 11.0 |
| Valentine | 9 | 10 | 25.0 | 111.1 | 6.0 |
| West Peacock | 91 | 3 | 31.0 | 3.2 | 32.0 |
| Wildlife Reserve | 279 | 174 | 4.0 | 62.3 | 14.0 |

*Ranks for allotments with equal values of I or of Critical Areas were averaged.

$$**I = \frac{CA}{A} \times 100.$$

**Source:** Museum of Northern Arizona

10. Natural Environmental Areas*

In addition to the 155,240 acres of public land in the southern portion of the Black Mountain Planning Unit that already have been reserved for wildlife (see Chapter I), there have been several locations within the unit identified for natural or scenic area designation or areas having primitive values and wilderness potential. These are discussed below and summarized by allotment in Table II-55, which also indicates the proposed improvements, acres disturbed, and scenic quality and visual resource management classification. The location of each area is shown in Figure II-30.

Natural areas are defined as research areas established and maintained for the primary purpose of research and education. Scientists and educators are encouraged to use research natural areas in a manner that is non-destructive and consistent with the purpose for which the area has been established. The general public may be excluded or restricted where necessary to protect studies or preserve research natural areas. Outstanding natural areas are established to preserve scenic values and areas of natural wonder. The preservation of these resources in their natural condition is the primary management objective. Access roads, parking areas, and public use facilities are normally located on the periphery of these areas. As per Section 6225.1, no person shall use, occupy, construct, or maintain improvements in natural areas in a manner inconsistent with the purpose for which the area is established; nor shall he use, occupy, construct, or maintain improvements unless permitted by law or authorized by the regulations of the provisions for natural areas.

a. Natural Areas

The five proposed natural areas have been identified by the Arizona Academy of Science for the Planning Division of the State Department of Economic Planning and Development. One of these -- Joshua Tree -- has been proposed because of unique vegetational characteristics. Grand Wash Cliffs, Boundary Cone, Sitgreaves Pass, and Red Lake have been proposed primarily because of their geographic and geological significance.

(1) Joshua Tree.[1] This proposed natural area includes 2500 acres of dense Joshua tree (Yucca brevifolia) forest on the bajadas of Iron Mountain, encompassing portions of the Diamond Bar/Gold Basin allotment. The proposed site is considered to be an outstanding example of the Mohave Desert floral community. Heavy travel to Lake Mead on the Pierce Ferry Road enhances the recreational value of the forest. This area also is identified as a natural scenic area by the BLM as part of the North Music Mountain area.

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*References for this subsection follow on page II-250.

## TABLE II-55

### NATURAL ENVIRONMENTAL AREAS: SUMMARY OF PROPOSED IMPROVEMENTS, ACREAGE DISTURBED, SCENERY QUALITY, AND VRM CLASSIFICATION BY ALLOTMENT

| Natural Environmental Areas | Allotment Location | Type of Improvement and Number of Acres Disturbed per Unit: Storage Tank (1/5) | Reservoir (2) | Windmill (1/4) | Well (1/4) | Spring Improved (1/4) | Pipeline (1 mile) | Water Trough (1/5) | Fence (1 mile) | Total Acres Disturbed | Scenery Quality | Visual Resource Management Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Areas | | | | | | | | | | | | |
| Joshua Tree | Diamond Bar/ Gold Basin | 3 | | 1 | | | | 2 | 3 | 4 | A | II |
| | Upper Music | | | | | No Improvements | | | | | | |
| Red Lake | Cane Springs | | | | | No Improvements | | | | | B, C | III |
| Sitgreaves Pass | Black Mountain, Silver Creek | | | | | No Improvements | | | | | A | II |
| Boundary Cone | Silver Creek | | | | | No Improvements | | | | | B, A | II |
| Grand Wash Cliffs | Clay Springs | | | | | No Improvements | | | | | A | II |
| Natural Scenic Areas | | | | | | | | | | | | |
| Pack Saddle and Windy Point | Cedar Canyon | | | | | No Improvements | | | | | A | II |
| | CQT | | | | 2 | | | | | ½ | | |
| North Music Mountains | Diamond Bar/ Gold Basin | 3 | 2 | 1 | | 1 | | 2 | 3 | 8½ | A | II |
| Clay Springs Canyon | Clay Springs | | | | | | 3¼ | 2 | 2 | 5½ | A, B | II |
| Mt. Tipton | Dolan Springs | | | | | No Improvements | | | | | B, A | II, III |
| | Cane Springs | | | | | 1 | | 1 | | ½ | | |
| Areas with Primitive Value* | | | | | | | | | | | | |
| Mt. Perkins | Big Ranch | | | | | No Improvements | | | | | A, B, C | II, IV |
| Willow Springs | Ft. McEwen | | | | | No Improvements | | | | | A, B, C | II, IV |
| | Gediondia | 9 | | | | 9 | ¾ | 10 | 10 | 17 | | |
| Mt. Nutt | Black Mountain, Silver Creek | 1 | | 1 | 1 | | ½ | | | 1 | A, B | II, III |
| Black Mesa | Black Mountain, Silver Creek | | | | | No Improvements | | | | | A, B | II, III |
| Totals | | 16 | 2 | 3 | 3 | 11 | 4½ | 17 | 18 | 37 | | |

*Also identified as wilderness and critical environmental areas.

**Sources:** Table I-10 and Figure I-4.

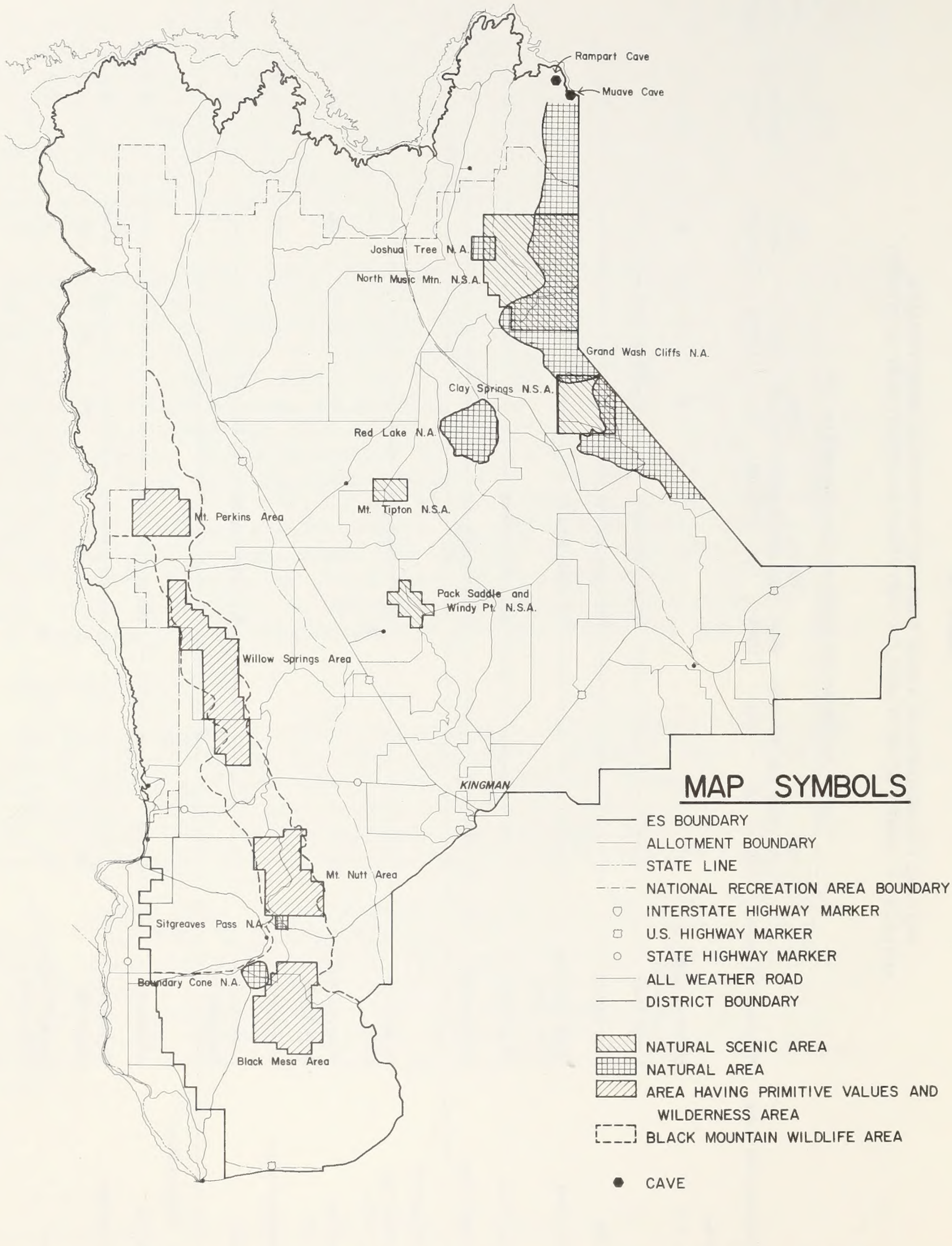



**FIGURE II-30 NATURAL ENVIRONMENTAL AREA LOCATIONS**

(2) Red Lake.[2] This proposed natural area, which includes 32,000 acres in the north central portion of the Hualapai Valley, lies within the Cane Springs allotment. As an undrained playa, Red Lake represents a unique type of terrestrial environment in northwestern Arizona. The playa has scientific and educational values as a field laboratory for ecological studies of dry lake beds and adaptations of flora and fauna to harsh desert conditions.

(3) Sitgreaves Pass.[3] Specific boundaries for this natural area have not yet been determined, but the principal area under consideration is in the Black Mountain range approximately two airline miles northeast of Oatman, within the Black Mountain and Silver Creek allotments. The area is characterized by complex volcanic flows with local appearances of tuff and intrusive material termed Gold Road latite. The lava flows present a wide variety of volcanic types and the area's main features are considered of scenic and recreational value. Sitgreaves Pass is the demarcation between the Mt. Nutt group of the Black Mountains, a rugged complex of volcanic flows, and the Black Mesa group of the Black Mountains, a remnant of a once extensive basaltic-appeal plateau. Historic mining sites and camps, geologic history, and spectacular scenery are also features of the area.

(4) Boundary Cone.[4] This proposed natural area is located on the western slope of the Black Mountains, 3.5 miles southwest of Oatman. It includes approximately 1300 acres, and is located within the Silver Creek allotment and the Black Mountain Wildlife Reserve. The area offers examples of heavily-eroded Tertiary volcanic flows, with associated tuffs, conglomerates, breccia, and intrusive bodies. The actual Boundary Cone is a spectacular example of an intrusive rhyolitic pinnacle and possesses scientific and educational values. This is the only natural area identified by the BLM.

(5) Grand Wash Cliffs.[5] This proposed natural area, located approximately 35 miles north of Kingman, extends from the Music Mountains northward beyond the Colorado River, encompassing approximately 128,000 acres within the Diamond Bar, Upper Music, Clay Springs, Music Mountain, Cane Springs (eastern segment), and Ceder Canyon allotments. The area has been recommended for natural area status because of its unique geological and ecological characteristics. The precipitous escarpment of the Grand Wash Cliffs forms the boundary between the Colorado Plateau region to the north and east, and the low desert regions to the south and west.

b. Natural Scenic Areas

The BLM has proposed that several areas within the ES boundaries be designated as natural scenic areas. These areas exhibit outstanding natural, scenic, recreational, or other values as identified by BLM and have been recommended for withdrawal from all forms of entry depending on the site.

Additional general recommendations include retention of lands under Federal ownership, forming block ownership of all lands within natural scenic areas through land tenure adjustment or land acquisition, restricting ORV use to existing roads and trails, and developing recreation management plans. The areas recommended for natural scenic designation include:

(1) Pack Saddle and Windy Point Natural Scenic Area. Presently designated as Pack Saddle and Windy Point recreation sites and located in the Cerbat Mountains, this area is planned for expansion to 5120 acres. Offering panoramic views to the east and west, this is an extremely rugged area in which mountain shrub and patterns of pine and juniper growth contrast the unit's various forms of plant life and enhance life forms. Ease of accessibility is unique to the region, which makes this potentially an outstanding natural scenic area for recreational use.

(2) North Music Mountain Natural Scenic Area. This 51,200-acre area, located in the northeastern part of the ES area, qualifies as a natural area due to its typical or unusual faunistic or floristic types and associations. The quality and quantity of existing *Yucca brevifolia* and varieties and rare combinations of juniper, pinyon, and Joshua trees enhance the overall natural qualities of the area. An extensive escarpment of unique geologic value to the area also adds scenic value.

(3) Clay Springs Natural Scenic Area. Approximately 15,680 acres in the Music Mountains south of the proposed North Music Mountains area exhibit outstanding scenic values. Hilly, rolling mountains above the Grand Wash Cliffs offer a view of the Grand Canyon to the northeast, and high vertical relief and juniper-dominated growth qualify this area for natural designation. Mineral entry, however, has not been restricted in this area.

(4) Mt. Tipton Natural Scenic Area. This area, comprising approximately 3840 acres, is located seven miles north of the Pack Saddle and Windy Point recreation sites. Physiographic features of this and the Pack Saddle area are quite similar.

c. Areas with Primitive Values

In addition to the above four areas recommended by the BLM, four other areas, all in the Black Mountain Planning Unit, have been identified as having primitive value. All are presently under the Black Mountains wildlife management area plan, and their management will be designed within the framework of this plan when it is prepared. The criteria by which these areas were identified are, according to BLM Manual 6221:

- Contains natural, wild, and undeveloped lands in a setting essentially removed from the effects of civilization.

- Has outstanding opportunities for solitude or a primitive and unconfined type of recreation.

- Is of sufficient size as to make practical its preservation and use in an unimpaired condition.

- May also contain ecological, geological, or other features of scientific, educational, or scenic value.

(1) Mt. Perkins Area. This area covers approximately 11,520 acres in the northern Black Mountains. Its scenic qualities are rated as A and B, primitive qualities as B. The area is characterized by boldly colored, rocky formations with vegetation commonly being a minor element. The area is a known desert bighorn sheep habitat.

(2) Willow Springs Area. Approximately 30,720 acres of this Black Mountains area is qualified primitive area. Located approximately 12-15 miles southwest of Grasshopper Junction, the area contains the western foothills of the Blacks and Colorado River flat area with unusual landform relief, juniper and Yucca, and a variety of shrub growth against coarse rock outcroppings and swelling landforms.

(3) Mt. Nutt Area. The Mt. Nutt area is approximately 20,800 acres of the Black Mountains one to two miles north of Gold Road (near Oatman). Most of the area lies in the Black Mountains sightseeing-scenery unit. Volcanic landform relief, unusual surface colorations, historic mining activity, and unique scenic interests along with the presence of bighorn sheep contribute to the scenery rating of A and the primitive quality rating of B.

(4) Black Mesa Area. This area is a known bighorn sheep habitat and is rated primitive quality class B. The scenery quality is class A and B and includes the western foothills and Black Mountains area. The approximate size of the primitive area is 23,680 acres; approximately three miles south of the Gold Road area, its location is near Oatman.

d. Wilderness Area

The Federal Land Policy and Management Act of 1976, Section 603(a), requires a review of identified potential wilderness areas, or roadless areas having wilderness characteristics as described in the Wilderness Act of 1964. The identification of such areas is based on the following:

- A contiguous area of public lands of 5000 acres or more, and,

- A roadless area. (This means the absence of roads which have been improved or maintained by mechanical means to insure relatively regular and continuous use. A way maintained solely by the passage of vehicles does not constitute a road.)

The four roadless areas lying within the study area and having wilderness potential are the same as the areas noted in 10-c above as having primitive values. The initial determination was made utilizing land status and transportation maps shown in subsection 7. A quality determination of the wilderness potential of these areas have not been made as, at present, no BLM regulations or criteria have been developed to implement Section 603(a).

e. Areas of Critical Environmental Concern

Section 102(a)(11) of the Federal Land Policy and Management Act of 1976 directs that all public lands, their resources, and other values be inventoried with priority assigned to areas of critical environmental concern. Several such areas have been tentatively identified and are discussed below. At present, however, no regulations or criteria have been developed by the BLM to implement this section of the act.

Three areas of concern are the habitat areas of the desert bighorn sheep, mule deer, and pronghorn. All 418 square miles of bighorn habitat are crucial and lie mostly within the Big Ranch, Diamond Bar/Gold Basin, Ft. McEwen, Black Mountain, and Gediondia allotments. They also utilize the ephemeral allotments of Portland Spring, Silver Creek, and Thumb Butte. These three allotments and part of Big Ranch are contained within the Black Mountain Wildlife Area. The mule deer habitat occurs primarily in the Cane Springs, Diamond Bar/Gold Basin, Crozier Canyon, and Hackberry allotments. The mule deer also populate all allotments except Curtain as noted in Table II-19. The pronghorn utilize 48 square miles of the Crozier Canyon, Cedar Canyon, and Hackberry allotments. These environmental areas are shown in Figure II-18 and the habitat use of each is discussed in subsection 6.

The other areas of critical concern are tentatively identified as the areas possessing primitive values as discussed in c above and threatened and endangered plants as discussed in subsection 5 and shown in Figure II-13. Similarly, the analysis of cultural resources has led to the identification of critical areas of historical and cultural value (subsection 9 above). These are the Grand Wash Cliffs, the west slope of the Black Mountains, Red Lake, the historic mining and ghost towns, and the spring areas. The Grand Wash Cliffs area overlaps the Grand Wash Cliffs natural area. The west slope of the Black Mountains extends from the crest of the Black Mountains west to the Colorado River. The four areas having primitive value and the Black Mountain wildlife area overlap with this cultural resource area. The historic sites are shown in Figure II-29 and the spring locations are shown in Figure II-10. The spring areas also are potentially critical riparian habitat sites as discussed in subsection 6 above.

A quality determination has not been made of these primitive, cultural, riparian, and threatened and endangered areas in order to prepare appropriate regulations and plans for protection. It is noted that before any installation of improvements, a visual impact analysis and cultural resource and endangered plant species clearances will be undertaken by the BLM.

## 11. Visual Resources

Visual resources in the Cerbat/Black Mountain Planning Units are an integral part of the recreational experience in the ES area. They are defined as the land, water, vegetation, and other visible features which characterize the landscape, and they are perceived by members of local communities, the ranchers and recreationists using the area, and those in transit through the area. Those in transit value the scenery differently than do local people more accustomed to it. From a community standpoint, scenery "use" is less important but nevertheless contributes to a personal sense of environment.

Visual resources of the unit are not confined to the unit boundaries. The areas bordering the unit also contribute to the overall scenic quality and sensitivity of the visual resources.

### a. Visual Resource Inventory and Evaluation Procedure

The BLM has established a systematic approach to identifying scenery quality and setting minimum standards for management of visual resources (Manual 6310). The visual resource management (VRM) inventory and evaluation comprise an integral part of multidisciplinary planning and are included in the procedure for planning resource use and development. Three key factors are considered in evaluating amount of modification the natural landscape can sustain:

- The inherent quality of the scenery being viewed,
- The visual sensitivity of the type of visual use, and
- The visual distance.

The elements of the evaluation are:

(1) Scenery Quality. Scenery quality is rated on the basis of landform, color, water, vegetation, uniqueness, and intrusions. Numerical values are assigned to these factors according to degree of occurrence. Areas to be rated for aesthetic quality (scenery units) are delineated by their similar physiographic and visual patterns and their similar impacts from intrusions (human degradation of scenery). The scenery units are graded A (highest) through C.

(2) Visual Sensitivity. Visual sensitivity levels are an index to the relative degree of visual response within the planning unit. Sensitivity level evaluation involves selecting and weighing criteria such as volume of use, use association, community attitudes, and others to determine the relative degree of importance of each factor to the others. Based on these criteria, areas of similar sensitivity are mapped. Field classification determines the importance of the criteria as it applies to the area(s).

(3) Visual Zone Delineation. Visual zones are delineated for class B scenery areas having a high or medium sensitivity. Foreground-middleground are outlined for class C scenery having high sensitivity. In this field step, all zones are delineated by traveling the primary recreational use corridors. Areas having similar scenery quality, sensitivity level, and visual zones are labeled on a preparation map.

(4) Visual Resource Management Classification. Management classes are assigned using a chart developed for this purpose, based on quality, sensitivity, and zone. Areas having like management classification are outlined on a map. These areas have been identified as VRM units and are used as a basis for writing VRM objectives in MFP-Step 1 activity recommendations.

b. Character of Visual Resources in ES Area

An inventory and evaluation of visual resources in the Cerbat/Black Mountain ES area was completed in late 1976 and early 1977 by BLM. The Cerbat unit was studied first. Problems with criteria interpretation surfaced as a result of inexperience with the system and the system's newness. Because of these problems, methodologies were changed to permit more accurate evaluation elsewhere. Consequently, the Black Mountian VRM evaluation may be more indicative of visual resources in that unit than the Cerbat evaluation was of its unit.

(1) The Cerbat Planning Unit. The Cerbat unit possesses various qualities of scenery as indicated in the ratings displayed in Figure II-31. Areas representing class A scenery (those receiving the highest rating relative to the proximity of the unit) include the upper reaches of the Cerbat Mountains, the Music Mountians, the Grand Wash Cliffs, Grapevine Canyon, and Grapevine Mesa. The Grand Wash Cliffs to the east provide outstanding scenic background to the Hualapai Valley. The Grand Canyon is also outstanding for background scenery in the northeastern part of the unit. These areas possess interesting diverse or unique vegetative, geologic, or scenic qualities and are relatively free from aesthetically undersirable intrusions.

In the east and northeast portions of the unit are the Grand Wash Cliffs, Grapevine Canyon, Grapevine Mesa, and Music Mountains. This area possesses a variety of scenic landforms including cliffs, mesas, rolling hills, and valleys. Rugged canyons, massive rock outcrops, and sculptured landforms contribute to outstanding scenery found in Grapevine Canyon and along the Grand Wash Cliffs (see subsection 10 above). The Joshua tree stand at Grapevine Mesa, and the rare floral combinations of Joshua tree, pinyon-juniper, and catclaw found in the Grapevine Canyon area are excellent examples of distinct vegetative texture and pattern (in the Diamond Bar/Gold Basin allotment).

The Cerbat Mountains consist of several peaks of high vertical relief, massive rock outcroppings, and black malapai foothills. Mountain shrub and patterns of pine and juniper growth contrast the area's various plant

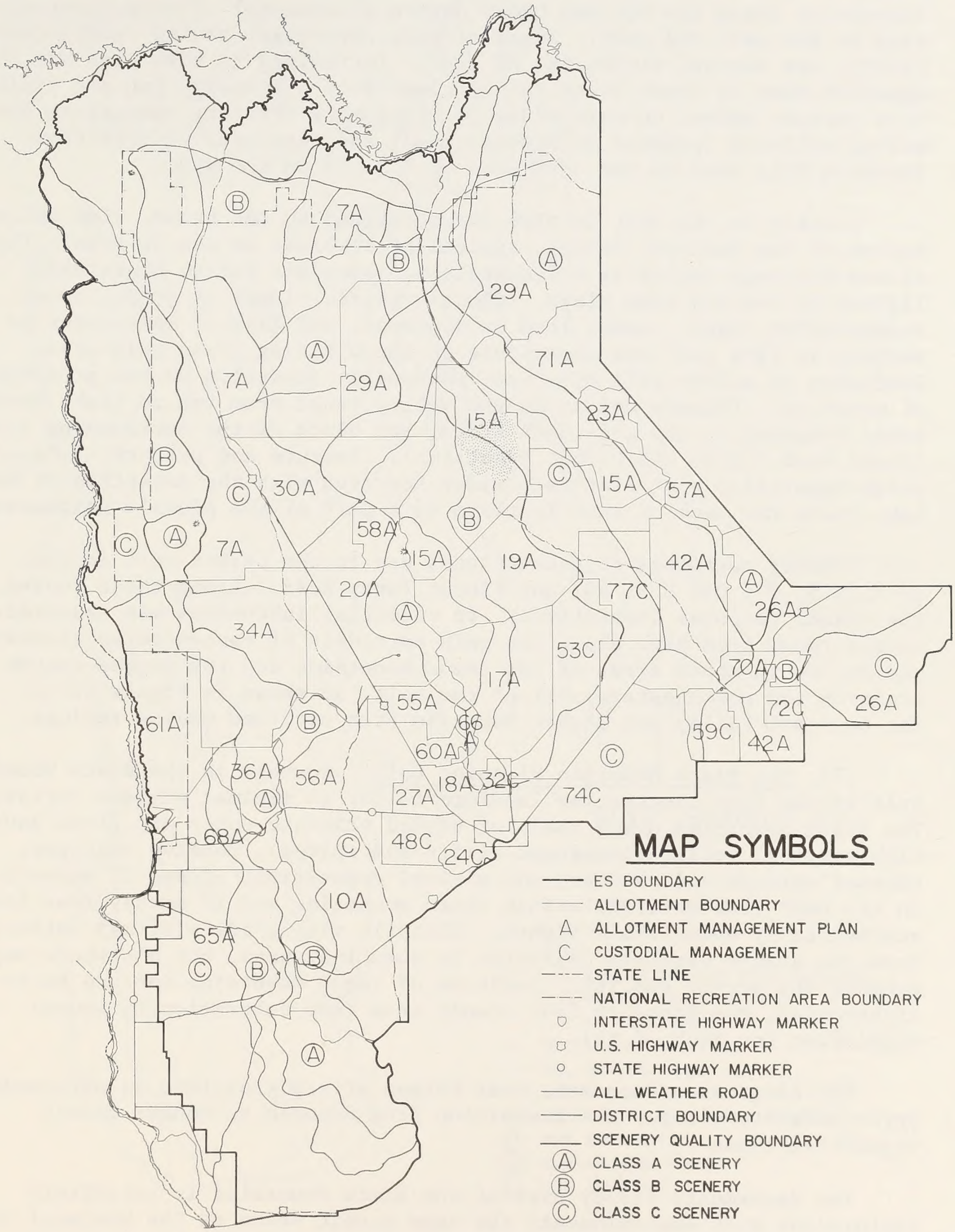



**FIGURE II-31 SCENERY QUALITY**

life and enhance landforms. Texture and color of these elements are rich and diverse with few inharmonious intrusions. Pack Saddle and Windy Point recreation sites (in CQT and Cedar Canyon allotments) offer a panoramic view to the east and west. Areas of this character, having ready accessibility, are unusual within the ES area. Intrusions to this area are less apparent than in those areas having class B or C scenery, but are visible to a certain extent on both sides of the range. Primary intrusions are mining activity (present or discontinued) and road cuts visible from Stockton Hill Road on the east side of U.S. 93 on the west.

Scenery in the unit is also characterized by the broad, flat valley bottom of the Hualapai Valley, typical of lowlands in the ES area. This closed-drainage valley is a featureless, sometimes barren plain highlighted by the Red Lake playa. Closely grazed clumps of grass, power transmission lines, roads, land development, and lack of uniqueness or variety in line and form contribute to the C rating given this area. Dominance of colors will also vary seasonally depending on the presence of moisture. Primary colors in the valley range from tan to light brown tones compared to the red, dark brown, and black of the surrounding mountains (Grand Wash Cliffs and Cerbat Mountains). Texture and pattern of desert scrub vegetation are relatively minor features with the exception of Red Lake where the lack of such features is a part of the playa's uniqueness.

Primary corridors of recreational use in the Cerbat unit include I-40, U.S. 93, Old U.S. 66, and Pierce Ferry Road. Along these routes, the visual response (sensitivity) to potential intrusions was measured. Levels range from high along the main corridors of concentrated recreational use to low in upper areas of the Music Mountains and the rugged canyon areas in the northeastern part of the unit, as shown in Figure II-32. The Hualapai Valley and Cerbat Mountain area received medium ratings.

(2) The Black Mountain Planning Unit. Scenery in the Black Mountains unit varies from spectacular landform relief to minimal surface variation. The Black Mountains are a chain of eroded volcanic cones and flows having high vertical relief (prominent cliffs and spires), massive outcrops, unusual surface colorations, and minimal vegetation. Class II scenery in the unit lies entirely within these mountains and is mostly free from aesthetically undesirable sights. Historic mining activity may detract from the area's desolate character in some instances, but elsewhere may enhance the scenic quality. Features of these mountains include burro sightseeing, the Boundary Cone scenic area (see subsection 10 above), and vegetation (or lack of it).

The Sitgreaves Pass area near Oatman offers travelers an outstanding opportunity to witness the transition from Sonoran to Mohave desert vegetative types.

The Sacramento Valley east of the Black Mountains is relatively featureless with approximately the same scenic value as the Hualapai Valley in the Cerbat unit (with the exception of Red Lake Playa). The valley has more vegetative texture and pattern (creosote, various cacti, and grasses), but utility lines, land development, and various structures disrupt the visual perception of the area. Scenic quality is rated C for this area.

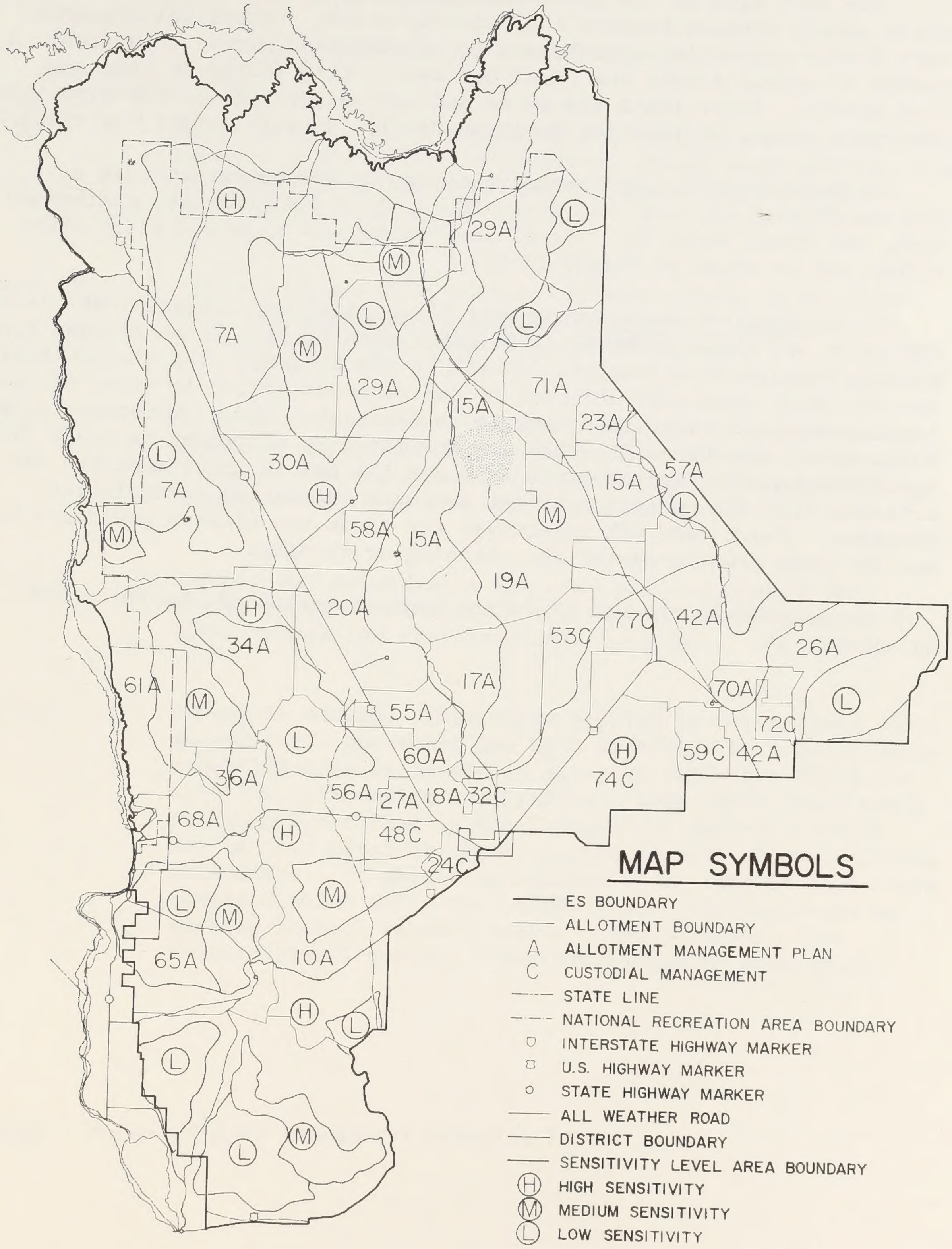



**FIGURE II-32 VISUAL SENSITIVITY**

The west side of the Black Mountains consists of a large featureless plain gently dipping towards the Colorado River. Except for creosote, very little vegetation exists here in the Colorado River flats area. A number of washes disect the flats but very little change in line and form occurs. Color tones are muted and intrusions become extensive towards the river (e.g., approaching Bullhead City). Scenery quality is rated C.

Primary corridors of recreational use in the Black Mountain unit include Highway 40, U.S. 93, State Route 68, Old Highway 66, Cottonwood Road, and State Route 95. Visual sensitivity was measured along these routes and is shown in Figure II-32.

(3) Visual Resource Management Classification. Classifications of VRM units are shown in Table II-56 and Figure II-33. These classes represent minimum management objectives for VRM in the ES area. The classification for the study area most affected by the proposed action in terms of water developments and range improvements is Class II. Those improvements to be built within the Class II areas are indicated by allotment in Table II-57. Specifications for improvements in Class III and IV areas meet the VRM criteria with the exception of the proposed vegetation manipulation programs. Short-term VRM objectives for these two classes would not be met in those areas proposed for chaining or burning.

Figures II-34 through II-36 are represnetative of the three VRM classes II through IV.

TABLE II-56

VISUAL RESOURCE MANAGEMENT CLASSES

| | |
|---|---|
| Class I - | This class provides primarily for natural ecological changes only. It is applied to primitive areas, some natural areas, and similar situations where management activities are to be restricted. |
| Class II - | Changes in any of the basic elements (form, line, color, or texture) caused by a management activity should not be evident in the characteristic landscape. |
| Class III - | Changes in the basic elements caused by a management activity may be evident in the characteristic landscape. However, the changes should remain subordinate to the visual strength of the existing character. |
| Class IV - | Changes may subordinate the original composition and character but must reflect what could be a natural occurrence within the characteristic landscape. |
| Class V - | Change is needed. This class applies to areas where the naturalistic character has been disturbed to a point where rehabilitation is needed to bring it back into character with the surrounding countryside. This class would apply to areas identified in the scenery evaluation in which the quality class has been reduced because of unacceptable intrusions. It should be considered an interim short-term classification until one of the other objectives can be reached through rehabilitation or enhancement. The desired visual quality objective should be identified. |

Source: Bureau of Land Management District Files.

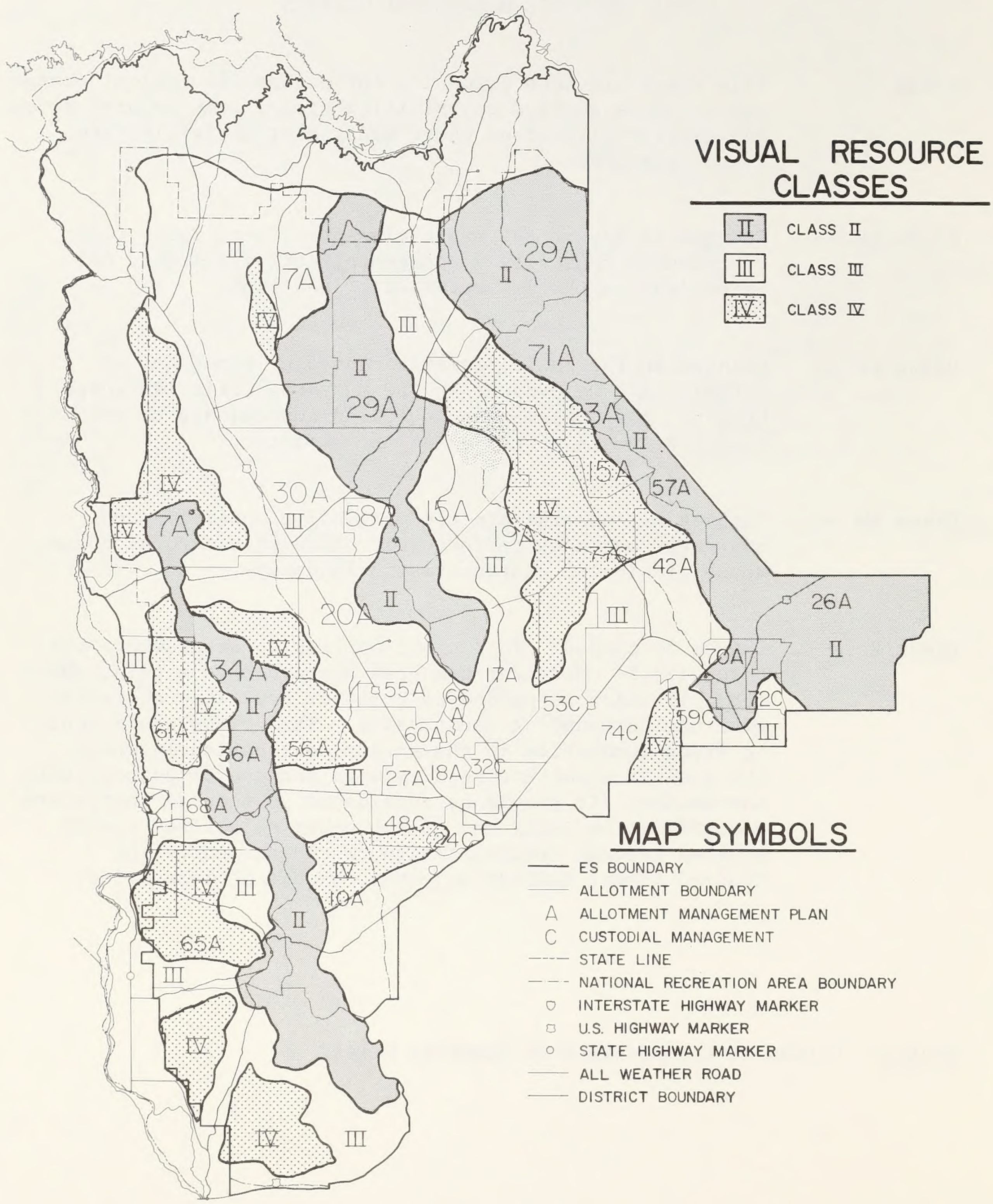



FIGURE II-33 VISUAL RESOURCES CLASSES

TABLE II-57

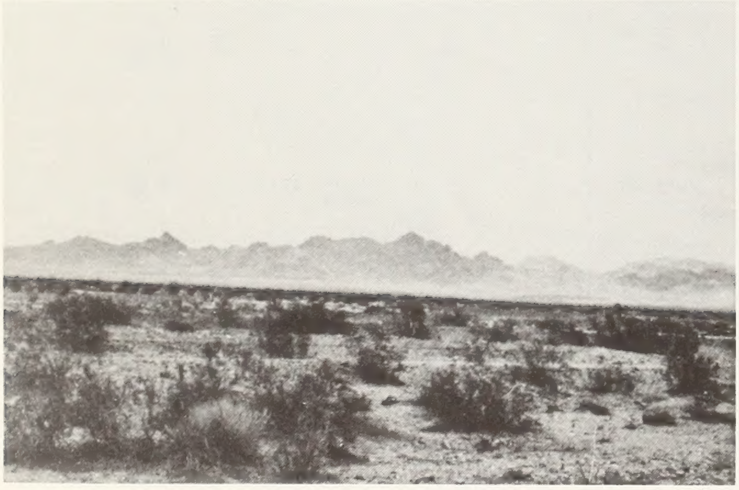
PROPOSED IMPROVEMENTS IN CLASS II VRM UNITS BY ALLOTMENT

| | Number and Type of Improvement | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allotment | Storage Tank | Reservoir | Wind-mill | Well | Spring | Pipeline (miles) | Water Trough | Fence (miles) | Corral | Water Catchment | Replace Existing Pipeline (miles) | Vegetation Manipu-lation (acres) | Disturbed Acre |
| Diamond Bar/ Gold Basin | 8 | 2 | | 2 | 1 | 11.0 | 9 | 3.0 | | | | | 22 |
| Upper Music Mountains | 2 | | | | 2 | 0.75 | 2 | 0.5 | 3 | | | | 3 |
| Clay Springs | | | | | | 3.25 | 2 | 2.0 | | | | | 5.5 |
| Cane Springs | | | | | 2 | | 2 | | | | | | 1 |
| Music Mountains | | | | | | | No Improvements | | | | | | |
| Cedar Canyon | | | | | | | No Improvements | | | | | | |
| Hackberry | | | | | 2 | 3.0 | | | | | | | 3 |
| Crozier Canyon | 2 | 3 | | 1 | 2 | 1.5 | 5 | 5.25 | | 2 | | | 17 |
| Big Ranch | | | | | | | No Improvements | | | | | | |
| Dolan Springs | | | | | | | | 2.25 | | | 6.5 | | 8.75 |
| Mt. Tipton | | | | | | | | 5.0 | | 4 | | | 9 |
| Cerbat/Quail Springs/ Turkey Track | 4 | | | 2 | 3 | 4.0 | 4 | 4.5 | | 1 | | | 12.5 |
| Mineral Park | 1 | | | | 2 | | 1 | 0.5 | | | | | 1.5 |
| Canyon Ranch | 2 | | | 2 | | | 2 | | | | | | 1 |
| Ft. McEwen | 6 | | | | 1 | 10.0 | 6 | | | | | | 12.5 |
| Gediondia | 9 | | | 7 | 5 | 1.5 | 15 | 10.0 | | | | | 19 |
| Thumb Butte | | | | 1 | | | | 2.0 | | | | | 2.5 |
| Black Mountain | 1 | | 1 | 2 | | 3.0 | 1 | 2.5 | | 1 | | | 7.5 |
| Truxton Canyon | | | | 1 | | | | | | | | 705 | 705.25 |
| | 35 | 5 | 1 | 18 | 20 | 38 | 49 | 37.5 | 3 | 8 | 6.5 | 705 | 831 |

Grapevine Canyon; Joshua tree foreground

Oatman Road/Sitgreaves Pass/Squaw Tit;
Black Mountains in background

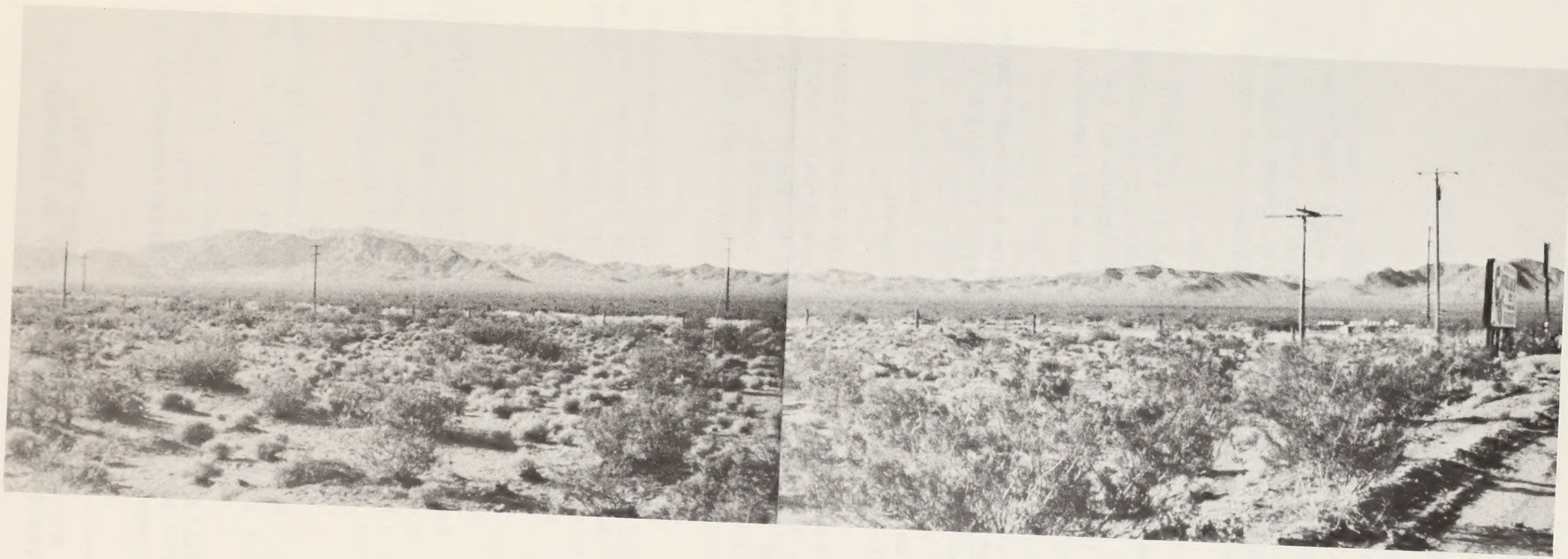
**FIGURE II-34 EXAMPLES OF VRM CLASS II**



West Foothills and Black Mountains background;
creosote bush, desert shrub foreground

Cerbat Mountains, Hualapai Valley/Red Lake area;
remnants of annual forbs

**FIGURE II-35 EXAMPLES OF VRM CLASS IV**



White Hills in background; creosote bush and white bur sage foreground

**FIGURE II-36 EXAMPLE OF VRM CLASS III**

12. Socioeconomic Conditions*

a. Demographic Characteristics**

(1) Size and Growth. The population of Mohave County, estimated at 39,400 in mid-1976, has grown at a higher rate since 1960 than population in the state. (See Table II-58.) The population is concentrated in the Kingman area, which houses more than one of every three Mohave County residents, in the northern part of the Mohave Valley, and around Lake Havasu City.

The population in the ES area was estimated at 22,800 in 1976, with the vast majority located in Kingman. The ranching population, estimated at 100 persons living on the ranch, has a small impact on the ES area: in total there is only one person directly involved with ranching for every 600 residents in the area.

(2) Age and Sex Distribution. Contrary to national trends, there have consistently been more men than women living in Mohave County. What has caused this anomaly in the county's population is not clear, but it may have resulted from the type of employment -- primarily mining and ranching -- and life-style which the county offered.

(3) Migration. Between 1965 and 1970, net in-migration into Mohave County was approximately 9500. Most of the in-migrants settled in the retirement communities of Lake Havasu City and Bullhead City, and have only marginal relationships with the ranching community. Hence, as Mohave County has grown, ranching has become a less significant factor in the county.

(4) Racial Distribution of the Population. The population of the county is predominantly white. The 1970 Census indicated that of a total population of 25,857, there were 21 blacks, 1275 persons of Spanish language and/or surname, and 869 Indians in the county.

b. Employment and Labor Force Characteristics

(1) Labor Force. Because of increasing labor force participation rates, Mohave County's labor force has grown even faster than its population and reached 14,049 in 1976. However, the labor force participation rate in the county -- 36% -- is still lower than in either Arizona or the nation.

(2) Unemployment. Mohave County's unemployment rate, which has been consistently higher than Arizona's, rose to 11.1%, or 1564, in 1976.

(3) Type and Distribution. The major economic activities in Mohave County, as shown for the past decade in Table II-59, include manufacturing, mining, tourism, and government services. Their importance to the local

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*References for this subsection follow on page II-251.
**Supplementary demographic data are provided in Appendix H.

TABLE II-58

MOHAVE COUNTY AND ARIZONA POPULATION - 1960-76
(thousands)

| | 1960 | | 1965 | | 1970 | | 1974 | | 1975 | | 1976 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mohave County | | | | | | | | | | | |
| Population | 7.7 | | 15.1 | | 25.9 | | 35.7 | | 37.6 | | 39.4 |
| Average Annual Growth Rate | | 14.4% | | 11.4% | | 8.0% | | 6.8% | | 4.8% | |
| Arizona | | | | | | | | | | | |
| Population | 1,302.2 | | 1,584.0 | | 1,775.4 | | 2,158.0 | | 2,212.0 | | 2,270.0 |
| Average Annual Growth Rate | | 4.0% | | 2.3% | | 5.0% | | 2.5% | | 2.6% | |
| Population Ranking Among Arizona Counties | 14 | | 12 | | 11 | | 10 | | 10 | | 10 |

Sources: Mohave County Special Census, 1974; U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population: General Social and Economic Characteristics, Arizona, Final Report PC(1)-C4, 1971; Bureau of the Census, 1960 U.S. Census of Population: Detailed Characteristics, Arizona, Final Report PC(1)-D4, 1962; Mohave County Planning and Zoning Commission; Arizona Department of Economic Security.

TABLE II-59

EMPLOYMENT BY SECTOR IN MOHAVE COUNTY - 1965-76

| | 1965 | 1970 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|
| Total Employment | 5,200 | 8,075 | 11,400 | 11,525 | 13,475 |
| Agriculture | 200 | 150 | 200 | 275 | 225 |
| Nonagriculture | 5,000 | 7,925 | 11,200 | 11,250 | 13,250 |
| Wage and Salary | 4,200 | 7,000 | 9,550 | 9,650 | 9,925 |
| Manufacturing | 350 | 600 | 1,550 | 1,650 | 1,625 |
| Mining and Quarrying | 450 | N.A. | 450 | 475 | 400 |
| Contract Construction | 300 | 1,000 | 1,125 | 725 | 725 |
| Transportation and Public Utilities | 250 | - | 500 | 500 | 525 |
| Trade | 1,050 | 1,400 | 2,150 | 2,250 | 2,275 |
| Fire | 150 | 300 | 325 | 350 | 375 |
| Services and Miscellaneous | 650 | 1,350 | 1,550 | 1,650 | 1,725 |
| Government | 1,000 | 1,525 | 1,900 | 2,050 | 2,275 |
| Other and Residual | 800 | 925 | 1,650 | 1,600 | 3,335 |

N.A. = Not available.

Source: Arizona Department of Economic Security.

economy is reflected in the fact that these sectors employed approximately 40% of all employees in the county in 1976. By comparison, agriculture -- which includes both ranching and farming activities -- is the smallest employment sector in the county: in 1976 it employed only 225 persons, compared to total employment of 12,485. Mohave County is also one of the least productive of all Arizona counties in farming and ranching.

Employment in the agriculture sector has increased only slightly over the 1965 level. Much of the increase has been in crop production as opposed to ranching. The value of production of livestock products in 1974 was $4.8 million, and increased to $5.2 million in 1976. This is approximately two-thirds of the value of total agricultural production in the county. In its recent assessment of the local economic outlook, the Mohave County Planning and Zoning Commission was not optimistic about the ability of the industry to increase productivity.[1]

(4) Basic Multipliers. As the employment base and range of economic activities in Mohave County are limited, it is probable that the economic base multiplier of the county is also limited. As part of its 1975 economic analysis, the Mohave County Planning and Zoning Commission calculated a basic employment multiplier of 2.18 using the minimum requirement technique. This means that for every export or basic job added to the county, an additional 1.1 import or non-basic job would be required and created. However, this technique has several deficiencies. First, a significant percentage of the county's basic income, which is the primary force behind the multiplier, is derived from such non-wage and non-salary sources as dividends, interest and rent, and transfer payments. Because there is a substantial elderly population in the county -- 11.7% 65 and older in 1974 -- the net transfer income to Mohave County is substantial. Because much of this transfer income comes from either pensions or Social Security payments, it is basic income to the local economy and, as such, is one of the generators of non-basic employment.

Sufficient information is not available to exactly calculate a basic to non-basic income multiplier. However, a review of projected income by source (see Appendix H) indicates that the basic non-basic income multiplier is approximately 1.5 compared to the 2.18 suggested by the Commission.

c. Income and Wages

The highest wages in Mohave County are earned by those employed in contract construction and mining. Wage rates in agriculture are unavailable because relatively few of the employees are hired on a year-round basis. Full-time employment in agricultural activities is generally at relatively low pay scales.

The vast majority of total income in the county is derived from other than farm and ranch sources. In 1975, agricultural income contributed approximately $1.4 million compared to a total personal income of approximately $169.7 million. The largest source of wages, salaries, and

proprietors' income is the manufacturing sector. Government is the second largest, and wholesale and retail trade contributed the majority of remaining income. Because income resulting from tourism activities is combined with non-tourism income in the wholesale and retail trade, finance, insurance, and real estate, services, and other industrial sectors, it is not possible to precisely determine the size of tourism income.

Per capita income in Mohave County has been less than the per capita state income since 1970. The county's 1976 per capita income of $4,543 was 85% of the statewide figure of $5,316. Median family income in the county in 1969 was $9,241 (Table II-60). It is estimated that none of the permittees in the ES area earned incomes during 1976 from the ranch operations equal to the median family income for the county in 1969. The average income for 50% of the permittees is about $6,500. Hence, except for the income derived from other sources, ranchers are in the lower income brackets in the community.

TABLE II-60

INCOME DISTRIBUTION IN MOHAVE COUNTY - 1969*

| | Mohave County |
|---|---|
| Less than $3,000 | 11.4% |
| $ 3,000- 5,999 | 16.4 |
| $ 6,000- 9,999 | 27.5 |
| $10,000-14,999 | 29.1 |
| $15,000-24,999 | 13.0 |
| $25,000 and over | 2.6 |
| Median Family Income | $9,241 |
| Median Family and Unrelated Individuals Income | 8,840 |
| Per Capita Income | 3,073 |

*Percent of families in each income bracket. Percentages may not add to 100% due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population: General Social and Economic Characteristics, Arizona, Final Report PC(1)-C4, 1971, pp. 109-110, 209.

d. Livestock Grazing Activities

(1) Ranch Characteristics. There are 26 allotments, as shown in Table I-3, which are leased by 21 permittees. Three of these allotments are classified ephemeral and do not have current or projected stocking rates or AMPs.* Consequently, the following discussion is representative of 23 allotments and 18 permittees.

The ranches in the ES area vary significantly in size and in allowable grazing capacity or AUMs. The largest ranch unit** (935,500 acres) is permitted 1810 cyls and the smallest (12,885 acres) is allowed 19 cyls. However, the smallest ranch (3670 acres) is permitted 25 cyls. As shown in Table I-3, there are 11 permittees in the ES area currently permitted less than 400 cyls and seven permittees with more than 400 cyls. While these smaller ranch units may produce reasonable economic returns during periods of high cattle prices, a fully self-supporting ranch unit would need to run at least 400 cows yearlong in order to be considered an economically sound ranch unit.[2]

The majority of ranches in the ES area are relatively small family-owned and operated ventures. This situation characterizes the 11 permittees mentioned above who have less than 400 cow units. To maintain their economic livelihood they wither subsidize their primary source of income with the cattle operation or, conversely, subsidize the cattle operation with other local employment. Two permittees in the ES area are known to have other ranching interests within and outside the state. At least three of the seven permittees having more than 400 cyls are known to derive income from other than ranch sources.

This economic condition is also brought about by the fact that for the past 20 years cattle ranching in desert and semi-desert areas has not been highly profitable except when cattle prices were high.[3] Moreover, based on market data of commercial ranches in Arizona, it has been observed that net returns to capital and management range from negative to 1% or 2% positive.[4] The discussion on income levels in c above also points out the low level of return to the rancher. It must be noted, however, that cattle ranching in the ES area provides a way of life for the many permittees and serves as a domestic protein source. Furthermore, as discussed in g below, most ranchers in the ES area desire to remain in the local area. The fact that the ES area rancher maintains the ranch as a home and "way of life" appears to justify these low percentage returns on investment.

Following is a description of the economic operations and characteristics of the livestock industry in the ES area. For a description of ranch activities and composition, see subsection 7 above.

(2) Cattle Shipments. Table II-61 shows that in-shipments for the state varied almost 50% for the 1971-76 period. Out-shipments varied less but were smaller, indicating that Arizona produces fewer cattle than it consumes, or is a net importer. Cattle in-shipments for Mohave County for

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*Managed under Ephemeral Range Special Rule, Part 43, CFR 4115.2-4.
**Several permittees operate a ranch containing more than one allotment.

TABLE II-61

CATTLE AND CALF IN- AND OUT-SHIPMENTS,
MOHAVE COUNTY AND ARIZONA - 1971-76

| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|
| Out-shipments | | | | | | |
| Mohave County | 19,035 | 20,868 | 27,625 | 20,330 | 27,859 | 17,735 |
| Arizona | 804,410 | 807,675 | 979,716 | 784,662 | 601,096 | 613,091 |
| In-shipments | | | | | | |
| Mohave County | 2,894 | 650 | 4,311 | 2,755 | 841 | 4,699 |
| Arizona | 821,663 | 1,052,398 | 1,012,169 | 579,681 | 787,455 | 556,022 |
| Net Out-shipments - Mohave County | 16,141 | 20,218 | 23,314 | 17,575 | 27,018 | 13,036 |

Sources: Arizona Crop and Livestock Reporting Service; 1976 Arizona Agricultural Statistics.

the last six years fluctuated dramatically from almost 2900 in 1971 to 650 in 1972 and back to 4699 in 1976, or a 723% variation from 1972. There is no discernible trend and little indication as to the in- and out-shipments being the same cattle and occurring in the same year or succeeding years. Out-shipments, on the other hand, varied only 57%, indicating a possible trend toward decreasing out-shipments.

The value of cattle sold out of Mohave County in 1976 was $5,162,000[5] or about 1% of the overall state total, and about 9% of Arizona range cattle. This is about the same as for 1975 but 20% higher than 1974, even though more cattle were shipped that year.

(3) Cattle Market Characteristics. The cattle market, both domestically and in Arizona, runs in 10-year cycles that are characterized by over- and under-production and extreme price fluctuations. The cycle often begins with the rancher's decision to reduce numbers or liquidate during the low price period, and is later influenced by the biological time limitation in rebuilding a herd. The cattle reduction cycle is also affected by the capacity of the nation's consumers to absorb the excess of big beef animals. While the total domestic cattle inventory varies about 15% during a cycle, the variations in supply relative to demand result in up to a 60% change in price.

At present, the industry is about midway along the long-term price rise and has reached the cost/price breakeven point. The downside occurred in 1974 at 25 cents/pound after a peak in mid-1973 at 65 cents/pound. A new peak price is expected to be realized in the early 1980s. These price variations are typical of the market where the decrease is generally sudden while the price increase is slow and erratic. Because of this short- and long-term market price volatility, the value of cattle in Mohave County at any point in time does not have a strong correlation to the price extremes or to an average.

Forecasting cattle prices with any degree of accuracy is hazardous because of this unique cyclic system and other indeterminable variables. Table II-62 vividly demonstrates the variation in cattle marketing from January 1957 through December 1976, as compiled from eight markets in the Midwest.[6] It is noted from this table that average feeder cattle prices in May 1959 were $28.52 per hundredweight (cwt) while 16 years later in March 1975 the same type of cattle were selling for $27.21/cwt. Just prior to the cattle depression of 1974, feeders reached an all-time average high of $58.08/cwt in August 1973, then fell to $27.41/cwt by November 1974. This price was again lower than the price for feeders in May 1959.

Figure II-37 shows cattle prices from 1957-76. The mean average price for feeder cattle during this 20-year period was $27.37. There were 14 recorded years where prices were below the mean average and eight years above the mean average.

(4) Cattle Sales. Table II-63 shows the characteristics and results of four different sales conducted by the Mohave County Cattle Grower's Association in 1971, 1975, and 1976. The auction sale facility and the sale itself were primarily designed to aid the smaller ranchers in Mohave

TABLE II-62

MONTHLY FEEDER STEER PRICES,* EIGHT MARKETS** COMBINED - 1957-76

| Year | Month: January | February | March | April | May | June | July | August | September | October | November | December | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1957 | $17.29 | $17.57 | $18.86 | $19.99 | $20.03 | $19.90 | $20.27 | $20.36 | $20.28 | $20.80 | $21.28 | $22.40 | $20.23 |
| 1958 | 23.51 | 24.00 | 25.52 | 26.22 | 26.45 | 25.32 | 25.53 | 24.78 | 26.25 | 26.72 | 27.20 | 26.33 | 25.85 |
| 1959 | 27.47 | 26.48 | 27.64 | 28.48 | 28.52 | 27.40 | 26.75 | 26.25 | 26.04 | 24.93 | 23.73 | 22.97 | 26.15 |
| 1960 | 23.60 | 24.05 | 24.90 | 25.30 | 24.34 | 22.66 | 21.66 | 21.20 | 21.58 | 21.95 | 22.97 | 23.81 | 23.02 |
| 1961 | 24.56 | 23.97 | 24.09 | 24.05 | 22.44 | 21.88 | 21.55 | 22.90 | 23.05 | 23.28 | 23.39 | 23.33 | 23.28 |
| 1962 | 23.45 | 23.60 | 24.05 | 24.87 | 23.91 | 23.55 | 23.75 | 24.41 | 25.42 | 25.67 | 24.90 | 25.32 | 25.40 |
| 1963 | 24.88 | 23.77 | 23.05 | 23.82 | 22.76 | 22.53 | 23.22 | 23.39 | 22.74 | 22.42 | 21.85 | 20.19 | 22.88 |
| 1964 | 21.46 | 21.01 | 21.12 | 20.10 | 18.66 | 18.56 | 18.40 | 19.03 | 20.01 | 19.41 | 19.05 | 18.14 | 19.53 |
| 1965 | 19.56 | 19.59 | 20.46 | 21.65 | 23.45 | 23.49 | 23.00 | 22.80 | 22.89 | 23.02 | 22.90 | 23.32 | 22.26 |
| 1966 | 24.34 | 24.70 | 26.93 | 25.68 | 25.30 | 24.65 | 23.95 | 25.22 | 25.42 | 24.80 | 24.21 | 23.81 | 25.04 |
| 1967 | 24.30 | 23.97 | 24.04 | 24.01 | 24.52 | 25.15 | 25.71 | 25.43 | 25.13 | 24.83 | 24.18 | 23.80 | 24.62 |
| 1968 | 23.96 | 25.26 | 25.90 | 26.10 | 26.13 | 26.15 | 26.48 | 25.89 | 25.49 | 25.60 | 25.90 | 26.21 | 25.75 |
| 1969 | 25.89 | 26.69 | 28.47 | 29.76 | 31.76 | 32.50 | 29.75 | 29.26 | 28.70 | 28.70 | 28.78 | 29.13 | 29.16 |
| 1970 | 29.63 | 31.13 | 32.47 | 31.62 | 30.59 | 30.76 | 30.30 | 29.20 | 29.19 | 29.73 | 28.37 | 27.60 | 30.16 |
| 1971 | 29.45 | 31.54 | 31.52 | 31.74 | 32.00 | 30.88 | 30.91 | 32.15 | 31.82 | 33.43 | 33.56 | 32.93 | 31.88 |
| 1972 | 35.68 | 36.50 | 36.01 | 35.74 | 36.29 | 38.13 | 38.85 | 37.52 | 38.62 | 39.50 | 38.16 | 38.99 | 37.55 |
| 1973 | 42.71 | 46.61 | 49.53 | 48.26 | 49.08 | 48.32 | 52.30 | 58.08 | 50.28 | 47.97 | 46.25 | 42.70 | 48.40 |
| 1974 | 48.20 | 45.30 | 42.58 | 41.66 | 36.58 | 32.58 | 34.59 | 34.21 | 26.69 | 29.28 | 27.41 | 28.05 | 36.75 |
| 1975 | 25.18 | 25.64 | 27.21 | 30.56 | 33.36 | 35.67 | 31.62 | 31.08 | 34.51 | 35.17 | 34.98 | 35.62 | 32.00 |
| 1976 | 35.25 | 38.31 | 37.37 | 42.23 | 40.43 | 39.27 | 36.78 | 36.56 | 33.73 | 34.82 | 34.00 | 34.38 | 37.08 |

*Weighted average cost per 100 lbs.
**The eight markets are South St. Paul, Kansas City, Omaha, Sioux City, Sioux Falls, Oklahoma City, National Stock Yards, and South St. Joseph.

Source: U.S. Department of Agriculture, Economic Research Service/Statistical Reporting Service, Agricultural Marketing Service, Statistical Bulletin 522.

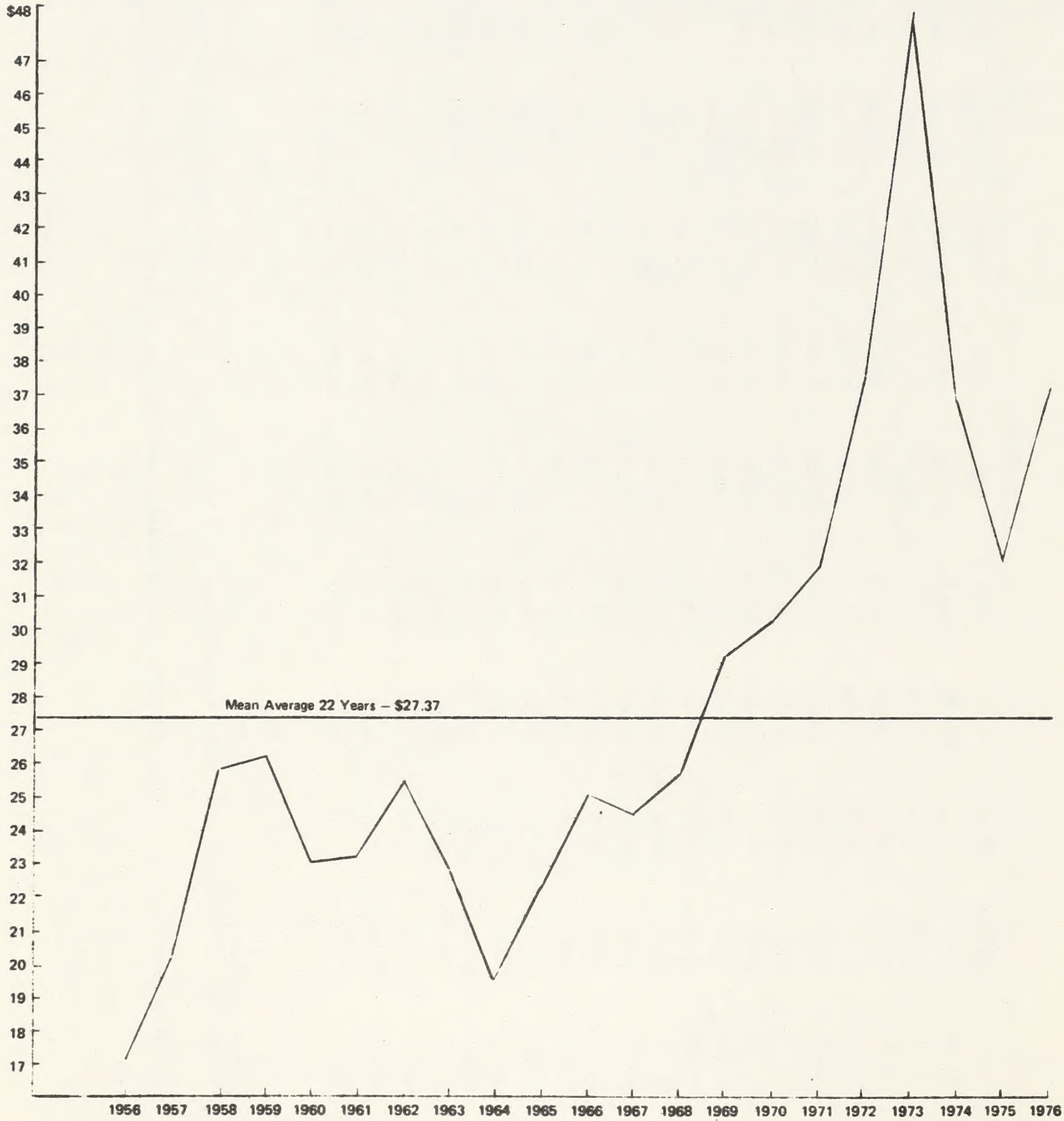


**FIGURE II-37**

**CATTLE PRICES**

TABLE II-63

MOHAVE COUNTY CATTLE GROWER SALES

| Description | 1971 | 1975 1st Half | 1975 2nd Half | 1976 |
|---|---|---|---|---|
| Number of Ranchers Selling | 24 | 25 | 14 | 21 |
| Number of Buyers | 18 | 14 | 10 | 10 |
| Total Cattle Sold | 2,319 | 3,634 | 769 | 1,605 |
| Steers - Total Sold | 1,413 | 2,250 | 685 | 1,009 |
| Total Weight (lbs) | 633,260 | 1,177,883 | 368,648 | 522,680 |
| Total Price | $237,110.06 | $377,338.70 | $117,491.25 | $216,934.36 |
| Average Weight (lbs) | 448 | 523 | 538 | 518 |
| Average Price per Pound | $ 0.37 | $ 0.32 | $ 0.32 | $ 0.42 |
| Average Price per Head | $ 167.00 | $ 161.00 | $ 171.00 | 214.00 |
| Heifers - Total Sold | 906 | 1,384 | 84 | 596 |
| Total Weight (lbs) | 369,203 | 649,534 | 35,800 | 250,609 |
| Total Price | $120,140.33 | $150,304.60 | $ 8,044.88 | $ 93,709.60 |
| Average Weight (lbs) | 407 | 469 | 426 | 420 |
| Average Price per Pound | $ 0.33 | $ 0.23 | $ 0.22 | $ 0.37 |
| Average Price per Head | $ 132.00 | $ 115.00 | $ 96.00 | $ 157.00 |
| Combined All Cattle Sales (including tags and pairs) | $357,250.39 | $543,908.80 | $125,536.13 | $310,643.96 |
| Combined Gross Weight (lbs) | 1,002,490 | 1,827,417 | 404,448 | 773,289 |
| Average Price per Pound - Steers and Heifers | $ 0.35 | $ 0.28 | $ 0.27 | $ 0.39 |

Note: In addition to steers and heifers sold, there was a remnant of other classes of cattle marketed (cows, bulls, etc.).

Sources: Arizona Crop and Livestock Reporting Service; 1976 Arizona Agricultural Statistics.

County in maximizing sale prices. Before the mid-1960s, when these cattle sales were initiated, the Mohave cattle producers marketed their cattle through one or two order buyers. It is also noted that the ranchers' goals for livestock marketing in the ES area, according to local interviews, are to sell 550-600 pound yearlings in May and June and market cull and good condition surplus cows yearlong as cow market prices peak for this class of livestock.

Although all cattle sold at these sales are not necessarily from the ES area, Table II-63 does indicate sale prices and cattle weights that are typical of the area. The 1971 steer weights averaged 448 lbs, 1975 weights averaged 523 lbs and 538 lbs, and 1976 weights averaged 518 lbs, all short of the ranchers' goals. There was about a 100-lb spread between heifers and steers. It should also be noted that steer and heifer prices were substantially higher for 1971 than 1975, but not as high as 1976 prices. The sale weights for each year are somewhat reflective of forage production (that is, total herbage production of annuals, forbs, and perennial grasses) for a year prior to sale. Cattle weights, however, are not an indicator of good, fair, or poor range condition.

(5) Herd Inventory Value and Composition. It is difficult to get a clear-cut calving percentage and herd composition because of the ES area ranch operating procedure and physical characteristics. As shown in Table II-64, the ratio of steers to heifers is approximately 2 to 1, with a smaller number of cows, bulls, and tagged cattle being retained on the ranch each year to replace older cows being sold and to compensate for the general low fertility and subsequent low calf crop percentage of the ES area.

Utilizing Mohave County livestock sale consignment records, ocular observation, and known steer and heifer sale ratios, plus the low fertility factor, and assuming a 15% retention of heifer calves plus a 10% holdback on lightweight steers, and a 3% death loss factor average, the calf crop percentage is estimated to be 65% for the ES area. Based on these factors, the herd inventory value for the 23 allotments is $1.97 million based on 7623 current allowable cyls, 1486 calves, and a herd composition as shown in Table II-64. This table also shows that 839 steers averaging 520 lbs are estimated to sell for $174,500, 610 heifers averaging 435 lbs for $90,200, and 228 cull cows averaging 800 lbs for $36,500. Gross receipts for the sale of these 1677 head of livestock would be $301,200. The average sale price for all livestock was $180 per head.

(6) Ranch Values. The value of the 18 ranch units in the ES area is difficult to estimate as the amount of the acreage per ranch varies considerably. Further, the value will vary with the location and condition of both private and leased land. However, based on discussions with ranchers and financial interests in the area, it is assumed that the current value of the ranches in the area is approximately $1,000 per cyl. Further, it is assumed that land comprises 47% of this value, improvements 21%, cattle 26%, and machinery 6%.

TABLE II-64

TOTAL HERD COMPOSITION AND INVENTORY VALUE,
ALL ALLOTMENTS - 1977

| Herd Composition | Cyl | Price per Pound | Weight (lbs) | Value |
|---|---|---|---|---|
| 50% Producing Cows | 3,812 | 22¢ | 1,000 | $ 838,600 |
| 20% Replacement Heifers | 1,524 | 37¢ | 600 | 338,300 |
| 5% Bulls | 381 | $400 each | | 152,400 |
| 3% Horses, Milk Cows | 229 | $300 each | | 68,400 |
| 11% Steers (sale type) | 839 | 40¢ | 520 | 174,500 |
| 8% Heifers (sale type) | 610 | 34¢ | 435 | 90,200 |
| 3% Cull Cows | 228 | 20¢ | 800 | 36,500 |
| Subtotal | 7,623[a] | | | $1,698,900 |
| 50% Heifers[b] | 1,010 | 40¢[c] | 300 | $ 121,200 |
| 50% Steers[b] | 1,010 | 48¢[c] | 300 | 145,000 |
| Subtotal | 2,020 | | | $ 266,600 |
| Total | 9,643 | | | $1,965,500 |

a. Includes custodial use area cyls.
b. 1486 calves one day old to yearlings based on 65% calf crop for producing cows and replacement heifers less sale type steers and heifers.
c. Lightweight calves typically are priced higher per pound than older animals.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

The current total value of these ranches therefore is estimated to be $7.62 million and the value per acre for private land,* $26.58. The land would be worth $3.58 million, improvements $1.61 million, cattle $1.97 million, and machinery $0.46 million.

It is noted that these estimates are orders of magnitude only and do not necessarily reflect specific ranch conditions as this information was not available.

(7) Economic Operations of the Ranch. Four ranches within the ES area were reviewed in depth regarding their operating and maintenance (O&M) costs. This analysis indicated a cost per cow unit ranging from $75-125. Further, the principal O&M categories of expense were determined as shown in Table II-65 and compared with a typical ranching operation in the central mountain area of Arizona.

TABLE II-65

COMPARATIVE DISTRIBUTION OF RANCH OPERATING AND MAINTENANCE COSTS

| O&M Category | ES Area | Central Mountain Area |
|---|---|---|
| Overhead | 23.2% | 30.1% |
| Labor | 15.3 | 15.9 |
| Machinery | 20.5 | 8.6 |
| Material | 12.3 | 8.6 |
| Custom Service | 1.5 | 1.1 |
| Interest | 9.0 | 9.7 |
| Depreciation | 18.2 | 25.5 |

*The central mountain data were collected and compiled by Charles Robertson, Farm Management Specialist, University of Arizona Extension Service, and Edward LeViness, Area Livestock Specialist, University of Arizona, during 1976 and spring 1977. The data are considered accurate but preliminary.

The distribution of costs is generally consistent except for overhead, which is higher in the central mountain area because the typical cow-cull operation there requires a higher rancher input. Machinery and material costs in the ES area are higher because the ranches are larger and more removed from wholesale dealers. The depreciation difference, however, is not explainable.

*286,683 acres of private controlled land exclusive of ephemeral lands, Table I-1.

The return side of the ledger can be determined based on herd composition of 15% cow retention, 10% replacement heifers, 5% bulls, 65% market steers and heifers (less replacement heifers), 10% cull cows, the $75-125 range of O&M costs and distribution as noted above, and the 65% calf crop production typical of the ES area. An estimate of ranch expense and return at the self-supporting level of 400 cows yearlong previously mentioned is shown in Table II-66. A further comparison is made with a more efficient cow-calf yield of 85% which is possible in the area with improved herd management. The largest return to investment, $22,060, is the 400-cyl ranch with 85% calf crop and having a $75/cow unit cost in operation and maintenance. In contrast, the greatest loss to investment, $10,030, is characterized by 400 cyls with a $125 O&M cost and a 65% calf crop.

According to discussions with local ranchers, ocular observation, and known resource production potential, none of the 23 allotments is operating with a $75/cow unit operation and maintenance expense and producing an 85% calf crop. Thus it can be seen in Table II-66 that the seven ranchers at 400 cyls or more are either earning a profit of about $9,290 or sustaining a loss as high as $10,030. The other 11 permittees are probably breaking even at best depending on O&M costs and on size of calf crop. Also indicative of their situation is the return estimated from an average ranch in the ES area that realizes a loss of $210. This is based on 331 cyls,* $100 O&M costs/cow unit, and 65% calf crop, as shown in Table II-67. Nine of the present permittees have more than 331 cyls, two are in the 200-300 cyl range, and seven have less than 100.

It would appear that the 18 ranchers in this economic situation cannot survive over extended periods of time without sufficient return to cover costs. Such returns can only be improved through more efficient herd management, some possible but not promising reduction in overhead, and increases in cattle prices which are volatile at best. It is evident, therefore, that nearly all of these ranchers have other sources of income, as noted previously. Further, as discussed in g below, their attachment to the land and a way of life goes far beyond a concern for economic return.

(8) Indirect Economic Effects of Ranching. The ranching activities described above have indirect and induced effects within Mohave County. Indirect impacts stem from the purchases of materials and services required to operate the ranch while induced impacts are created by the expenditure of wage and salary income earned by the ranching community. and employees of those businesses which service the ranching community.

Supplies are purchased both within and outside Mohave County. Table II-68 presents estimates of the volume of purchases by ranchers from county suppliers based on interviews with ranchers in the ES area. Only those purchases that will create additional income and employment in Mohave County are represented. These purchases, however, are only a small percentage of total sales of commercial establishments in Mohave County.

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*7623 cyls divided by 23 allotments.

## TABLE II-66

### ESTIMATED RANCH* EXPENSES AND RECEIPTS – 400-COW UNIT RANCH

| Expense Item | Percent of Total O&M Budget | 400 Cyl with $75/Cow Unit O&M | $100/Cow Unit O&M | $125/Cow Unit O&M |
|---|---|---|---|---|
| Overhead | 23.2% | 6,990 | 9,320 | 11,650 |
| Labor | 15.3 | 4,590 | 6,120 | 7,650 |
| Machinery | 20.5 | 6,150 | 8,200 | 10,250 |
| Material | 12.3 | 3,690 | 4,920 | 6,150 |
| Custom Services | 1.5 | 450 | 600 | 750 |
| Interest | 9.0 | 2,700 | 3,600 | 4,500 |
| Depreciation | 18.2 | 5,460 | 7,280 | 9,100 |
| Total Expenses | | 30,030 | 40,040 | 50,050 |

| Herd Composition | Calf Crop 65% | 85% | 65% | 85% | 65% | 85% |
|---|---|---|---|---|---|---|
| Cows | 340 | 340 | 340 | 340 | 340 | 340 |
| Replacement Heifers | 40 | 40 | 40 | 40 | 40 | 40 |
| Bulls | 20 | 20 | 20 | 20 | 20 | 20 |
| Market Steers | 111 | 145 | 111 | 145 | 111 | 145 |
| Market Heifers | 71 | 105 | 71 | 105 | 71 | 105 |
| Cull Cows | 34 | 34 | 34 | 34 | 34 | 34 |

| Receipts | Weight | Price per Pound | No. of Head | Total Price | No. of Head | Total Price | No. of Head | Total Price | No. of Head | Total Price | No. of Head | Total Price | No. of Head | Total Price |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cows (cull) | 800 | $0.20 | 34 | $ 5,440 | 34 | $ 5,440 | 34 | $ 5,440 | 34 | $ 5,440 | 34 | $ 5,440 | 34 | $ 5,440 |
| Bulls (cull) | 1,100 | 0.30 | 3 | 990 | 3 | 990 | 3 | 990 | 3 | 990 | 3 | 990 | 3 | 990 |
| Heifers | 435 | 0.34 | 71 | 10,500 | 105 | 15,500 | 71 | 10,500 | 105 | 15,500 | 71 | 10,500 | 105 | 15,500 |
| Steers | 520 | 0.40 | 111 | 23,090 | 145 | 30,160 | 111 | 23,090 | 145 | 30,160 | 111 | 23,090 | 145 | 30,160 |
| Total Receipts | | | 219 | $40,020 | 287 | $52,090 | 219 | $40,020 | 287 | $52,090 | 219 | $40,020 | 287 | $52,090 |
| Total Ranch Operation and Maintenance Expenses | | | | $30,030 | | $30,030 | | $40,040 | | $40,040 | | $50,050 | | $50,050 |
| Profit or (Loss) | | | | $ 9,290 | | $22,060 | | ($ 20) | | $12,050 | | ($10,030) | | $ 2,040 |

*$75-$100-$125 operation and maintenance expenses per cow units with 65% and 85% calf crops.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

TABLE II-67

AVERAGE RANCH* EXPENSES AND RECEIPTS - CURRENT STOCKING RATE

| Expense Item | Percent of Total O&M Budget | O&M Costs* |
|---|---|---|
| Overhead | 23.2% | $ 7,700 |
| Labor | 15.3 | 5,100 |
| Machinery | 20.5 | 6,800 |
| Material | 12.3 | 4,100 |
| Custom Services | 1.5 | 500 |
| Interest | 9.0 | 2,900 |
| Depreciation | 18.2 | 6,000 |
| Total | 100.0% | $33,100 |

| Herd Composition | 65% Calf Crop |
|---|---|
| Cows | 282 |
| Replacement Heifers | 34 |
| Bulls | 15 |
| Market Steers | 92 |
| Market Heifers | 58 |
| Cull Cows | 28 |

| Receipts | Weight (lbs) | Price per Pound | Number of Head | Total Price |
|---|---|---|---|---|
| Cows (cull) | 800 | 20¢ | 28 | $ 4,480 |
| Bulls (cull) | 1,100 | 30¢ | 3 | 990 |
| Heifers | 435 | 34¢ | 58 | 8,280 |
| Steers | 520 | 40¢ | 92 | 19,140 |
| Total Receipts | | | | $32,890 |
| Total Ranch O&M | | | | $33,100 |
| Profit (Loss) | | | | $ (210) |

*7,623 cyls divided by 23 allotments = 331 cyls average, $100/cyl O&M cost.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

Transportation, fuel, and utilities are purchased locally but these expenses account for only about 16% of total ranch expenses as shown in Table II-68. Feed, which is the largest category of purchases, is generally purchased from suppliers in Needles, Blyth, and Prescott. Similarly, only a small percentage of expenses for legal and accounting services and insurance is purchased from local sources.

Based on the interviews, it appears that the majority of the allottees utilize local banks for their banking services, including loans. Therefore, interest payments can be expected to accrue to the local economy. Several of the larger allotments which have absentee owners, however, have established financing sources outside the county.

Approximately 75% of ranchers' personal purchases for food, clothing, household goods, etc., are made within Mohave County. Some major purchases, such as household appliances and vehicles, are often made from sources outside of the county.

Estimates of indirect employment created by ranch activities are based on sales per employee for each of the expenditure categories. The level of sales required to support each employee is high, indicating that relatively few employees will be supported by ranching operations, as shown in Table II-69. In this table, the estimate of indirect employment is made by dividing the level of sales in each sector by the saler per employee ratio for that sector. Total indirect employment ranges from five to eight persons, or about 0.04% of the county's labor force. Total wages of the indirect employees are estimated to be $76,700, or about 0.03% of total county personal income in 1975. Because the linkages in Mohave County are not strong, the second level of indirect impacts would be insignificant and, therefore, has not been estimated.

In c above, an income multiplier of 1.44 was developed using estimates of income provided by the Bureau of Economic Analysis of the U.S. Department of Commerce. This multiplier can be applied to the direct and indirect income received from ranching activities to estimate the total amount of income which accrues to Mohave County as a result of ranching activities. Since the estimates of income include only that income derived from ranch operations or indirect activities and does not include other income that may be received from interest, dividends, rental, and transfer payments, the income has been adjusted upward by a factor for these other sources. The factor, 1.481, equals the percentage that these other sources of income are of wage and salary income in Mohave County during the 1970-75 period. Because many of the transfer payments are sent to retirees and disabled persons in Mohave County it is an overestimate, and as a result the estimate of induced impacts related to ranching activities is also overestimated. However, since even this overestimate suggests that ranching-produced income contributes only 0.1% of total income in Mohave County, it is clear that ranching does not have a significant impact on the county.

TABLE II-68

RANCH EXPENDITURES IN MOHAVE COUNTY

| Category of Expense | Percent of Total Expenditure | Percent Mohave County Purchases | Expenditures in Mohave County | | |
|---|---|---|---|---|---|
| | | | $75/Head | $100/Head | $125/Head |
| Salaries and FICA Taxes | 15.3% | 75% | $ 66,471 | $ 88,628 | $110,786 |
| Feed | 9.7 | 10 | 5,547 | 7,395 | 9,244 |
| Transportation Expenses | 9.2 | 100 | 52,604 | 70,137 | 87,676 |
| Fuel and Utilities | 6.7 | 100 | 38,314 | 51,082 | 63,851 |
| Taxes, Commissions, and Inspections | 19.2 | 20 | 21,957 | 29,276 | 36,595 |
| Legal and Insurance | 2.2 | 30 | 3,774 | 5,032 | 6,290 |
| Interest | 10.0 | 80 | 45,744 | 60,992 | 76,240 |
| Miscellaneous | 10.4 | 70 | 41,626 | 55,502 | 69,378 |
| Total | 82.7%* | | $276,037 | $368,044 | $460,061 |

*Less than 100% because of depreciation costs.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates.

TABLE II-69

INDIRECT RANCH-SUPPORTED EMPLOYMENT IN MOHAVE COUNTY

| Category | Sales per Employment-year | Employees* | | |
|---|---|---|---|---|
| | | $75/Head | $100/Head | $125/Head |
| Feed | $62,100 | 0.01 | 0.12 | 0.15 |
| Transportation Expenses | 29,240 | 1.80 | 2.40 | 3.00 |
| Fuel and Utilities | 69,900 | 0.55 | 0.73 | 0.91 |
| Taxes, Commissions, and Inspections | 40,000 | 0.55 | 0.73 | 0.91 |
| Legal and Insurance | 62,100 | 0.06 | 0.08 | 0.10 |
| Financial Institutions | 62,100 | 0.74 | 0.98 | 1.23 |
| Miscellaneous | 44,000 | 0.95 | 1.26 | 1.58 |
| Total | | 4.74 | 6.30 | 7.88 |

*Full-time equivalent employees.

Sources: Arthur D. Little, Inc., estimates; U.S. Department of Commerce, Bureau of the Census, 1972 Census of Manufacturing, 1972 Census of Transportation, 1972 Census of Wholesale-Retail Trade, 1972 Census of Selected Services, 1972 Census of Governments.

Table II-70 provides estimates of the induced employment supported by ranching activities. This estimate was made by subtracting from the estimate of total income the estimate of ranch and indirect income.* The difference shows the income earned by persons employed by the induced activities of the ranching sector. Induced employment is estimated by dividing individual income by an average wage for the retail, service, and finance sectors. Induced employment is between four and seven person-years, less than 0.23% of total county employment in these three sectors during 1976.

In summary, total employment related to ranching is between 46 and 52 persons and total income related to ranching activities is between $186,600 and $310,900. The average wage for each person deriving his employment from ranching activities was $5,100 or 40% of the average wage for a member of the labor force in Mohave County during that year.**

e. Government Revenues

The primary source of revenues for Mohave County is the tax on personal property. At 18% of full cash value, the assessed valuation of an average ranch of the 21 permittees is estimated to be $65,300 based on a ranch value of $7.62 million. This represents less than 0.12% of the assessed value of all the property in Mohave County. The total assessed value is estimated to be $1.37 million.

Property tax rates in the rural part of the ES area vary between $7 and $9 per $100 of assessed valuation. The total taxes for the 21 permittees range from $95,900-123,300, or $4,600-5,900 per year per ranch. The ranching community, however, does not contribute significantly to other forms of local revenues. The ranching community, therefore, has an almost minuscule impact on total tax receipts in Mohave County.

County government also receives significant monies from the state through shared taxes including the privilege sales tax, the motor vehicle fuel tax, and the alcohol beverage license tax. In addition, the county receives state grants from several sources as well as grants from the Federal Government.

The actions of the ranching community have only marginal impacts on the amounts of revenue received from any of these sources, however, and conversely the ranching community receives only marginal benefits.

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*Indirect wage and salary income was multiplied by a factor of 1.481 for the same reasons that this factor was applied to ranching income.

**Average wage per employee, $12,600, was determined by dividing per capita income in Mohave County, $4,543 in 1976, by the labor force participation rate for the county for that year which was 36%.

TABLE II-70

INDUCED LEVEL RANCH-SUPPORTED EMPLOYMENT AND INCOME - CURRENT STOCKING RATE, 7,623 CYLS

| | Ranch O&M Costs | | |
|---|---|---|---|
| | $75/Cyl | $100/Cyl | $125/Cyl |
| Direct Ranch Income[a] | $ 87,500 | $116,600 | $145,800 |
| Adjusted Ranch Income[b] | 129,600 | 172,700 | 215,900 |
| Total Income[c] | 186,600 | 248,700 | 310,900 |
| Income of Ranchers and Indirect Employees[d] | $147,200 | $196,000 | $245,100 |
| Induced Income[e] | 39,400 | 52,700 | 75,800 |
| Induced Employment[f] | 3.4 | 4.6 | 6.5 |
| Total Employment | 46.1 | 48.9 | 52.4 |

a. 15.3% of total O&M costs.
b. Direct income times Bureau of Economic Analysis adjustment multiplier of 1.481.
c. Adjusted income times income multiplier of 1.44.
d. Average wage of $12,600 per indirect employee, number of indirect employees, Table II-69.
e. Total income less direct ranch and indirect income.
f. Induced income per employee, $11,600.

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Economics Information System; Arizona Department of Employment Security; Arthur D. Little, Inc., estimates; American Ag International estimates.

The State Land Department currently leases 91,913 acres to some of the BLM permittees at an average annual rate of $0.0752 per acre. The total amount received by the Department from permittees during 1976 was $6,910.

The BLM revenues from its grazing permits in the ES area are based on the AUMs permitted on each allotment. At the current rate of $1.51 per AUM and a stocking rate of 62,571 AUMs,* the fees were $94,500 in the fiscal year 1976.

The BLM has recently revised the manner in which revenue from grazing fees is allocated. It has directed that 50% of all monies received for grazing domestic livestock on public lands be credited to a separate account in the U.S. Treasury. Half of this amount will be available for use in the district from which the fees were derived, for the purposes of range rehabilitation, protection, and improvements on such land. The remaining half will be used for range rehabilition, protection, and improvement in areas as the Secretary of the Interior directs. The remaining 50% of all such revenues will be placed in the general fund of the United States.

The amount available for improvements under these guidelines therefore was $23,600 in 1976.

f. Social Support Facilities and Services

The ES study area is located within the political jurisdiction of Mohave County, the largest county in Arizona. Within the county there are two areas not provided with public services which lie outside the study area, the Arizona strip north of the Colorado River and the Hualapai Indian Reservation in the northeastern section. The rest of the county is divided into three public service jurisdiction as follows:

- o Kingman and its environs
  - Chloride, Dolan Springs, and Meadview to the northwest and accessed by Route 93
  - Sacramento Valley west of Kingman on Highway 68
  - Hackberry/Valentine/Truxton to the east and northeast on old Route 66
  - Big Sandy area including Wikieup to the southeast on Route 93
- o Mohave Valley
  - Upper Mohave Valley on the Colorado River south of Davis Dam, including Bullhead City and Riviera-Holiday Shores

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*AUMs on Federal lands only.

- Lower Mohave Valley adjacent to the Fort Mohave Indian Reservation bounded by Topock and Yucca on Interstate 40/Route 66, with Oatman in the central mountain area

o Lake Havasu area -- south of Mohave Valley on Lake Havasu, formed by the Colorado River.

The impact area covered by this ES includes the Kingman area, except for the Big Sandy and Lake Havasu areas. The county government is responsible for delivery of all local public services in the county except for the area surrounding Kingman, the areas administered by special districts such as the Lake Havasu Irrigation and Drainage District, and the Indian reservations. Federal and state public service agencies as described below are largely centered in and operate out of Kingman.

The recent in-migration to the county has placed an increasing burden on the service requirements of both Kingman and the state and Federal agencies. A June 1976 report by the Mohave County Planning and Zoning Commission on the community facilities cited the critical lack of building space in the city for administrative, operating, training, and storage/garage purposes. The new City Complex completed in 1974, the new county jail, and the new BLM facility in Kingman have relieved the congestion for local agencies, but state and county offices are still overcrowded. Furthermore, the rapid rate of population growth in the county, particularly of the elderly and low-income groups, has not been matched by the expansion of government services, despite the fact that the government sector is the largest single employer in the county.

(1) Federal Services. The U.S. Government agencies providing direct service to the community in general and the ranching community in particular include the BLM, the Postal Service, the Soil Conservation Service, Farmers Home Administration, and the National Park Service. Other departments and agencies do serve the area but either indirectly or minimally as their services are not often required and the offices are remotely located in Phoenix. These agencies and services are summarized in Appendix H and are briefly described below.

The U.S. Department of Agriculture's Soil Conservation Service operates through the Conservation Districts organized by the state. These districts are managed by an elected and unsalaried board of local citizens. The SCS renders technical advice and manpower assistance to district cooperators at their request on the conservation and development of soil and water resources. It also utilizes the Agricultural Conservation Program, which grants financial assistance up to a maximum of $1,500 per year per project per cooperator.

Three-fourths of Mohave County is served by the Big Sandy Soil Conservation District which has a staff of three SCS specialists in its Kingman field office. Besides conducting research projects on soil conditions and inventories of soil and water resources, the SCS specialists assist landowners, namely ranchers and farmers, on the selection of

crops and the development of water resources, land grazing activities, and other related subjects. Although most of their recent efforts have focused on the Fort Mohave Reservation and the Lower Mohave Valley, the SCS staff work with the ranchers in the ES area and have a positive "image" in the ranching community. The SCS is currently developing information on range conditions in the study area as a data base for aiding grazing management activities.

The Farmers Home Administration provides home loans to communities under 10,000 population and is applicable throughout Mohave County. This service is more directly responsive to the in-migrant's need for housing and is not directly involved with the rancher.

The National Park Service, which has responsibility for the Lake Mead National Recreation Area, has minimal contact with Mohave County residents. Rangers, while enforcing Federal statutes on park lands, also have a mutual aid agreement with the Mohave County Sheriff's Department.

The role of the BLM is the subject of this ES and its institutional structure and operations are discussed in Chapter I and subsection 13 below.

(2) State Services. The services of the State Department of Economic Security, which provides employment service, food stamps, protection services, public assistance, unemployment insurance, veterans services, and vocational rehabilitation, are primarily used by the more urbanized residents of the county. Services provided by the Arizona Game and Fish Department and the Cooperative Extension Services of the University of Arizona are used primarily by those in the rural areas.

The enforcement of game statutes, collection of data, and control of harmful recreation activities in Mohave County are the responsibilities of the Region III Game and Fish office which is headquartered in Kingman. A staff of 13 officers and several office employees, aided by radio-equipped pickup trucks and radio patrol boats, regulates approximately 18,000 square miles that include all of Mohave County except for Lake Havasu City.

The Department of Public Safety, with its divisions of the Highway Patrol and Criminal Investigations, is responsible for enforcing highway traffic regulations and liquor and narcotics statutes. Twenty-four patrolmen and six higher ranking officers, with a 24-hour squad car per man, patrol all of Mohave County and part of Yavapai County.

(3) Local Services. Mohave County is responsible for providing public services to the unincorporated lands in the ES area. The operations base of these public services is the county seat in Kingman and includes agricultural and home economics services, extension service, soil testing laboratory, animal control, health and hospital services, sanitary landfills, planning and zoning, parks, fairgrounds, roads, library service and schools, county sheriff, constable, and juvenile corrections and probation. Other county offices include the Board of

Supervisors, the Department of Motor Vehicles, CETA, and County Coroner. Additional information on these services and their jurisdictional boundaries are provided in Appendix H. In addition, two recent reports provide a more complete description of services:

- Community Facilities, Mohave County, Arizona, Mohave County Planning and Zone Commission, June 1976, and

- Environmental Services Needs Study, Mohave County, Office of Economic Planning and Development, State of Arizona, March 1974.

The City of Kingman, which has a council-manager form of government, provides police and fire services, as well as water and sewer services, to residents within the 13-mile city boundary and to unincorporated areas within three miles of the city limits. The city also develops recreational and social facilities including the Municipal Golf Course, parks, and community centers in cooperation with local public organizations or private corporations.

The needs of other areas, primarily for basic services such as fire protection, water, and sewers, are met either by the formation of special assessment districts, local nonprofit community efforts, or by private companies. Electricity and telephone throughout most of the county are provided by the Citizens Utilities Company.

The main recipients of these protective, environmental, and social support services are the urban communities and the outlying community clusters. The ranchers benefit if they maintain a house in or close to a town. For the most part, however, the ranchers are remotely located and provide their own electricity, water, and sewer services.

The ES area encompasses eight elementary school districts, two high schools, and three campuses and eleven satellite units of the Mohave Community College. All elementary schools in the impact area have adequate facilities and a student capacity that exceeds present enrollment. School attendance among the ranching community occurs mostly in the elementary and high school levels, with a few adults attending the Community College.

The provision of health services to Mohave County's growing population -- and especially a population like the elderly which requires a greater proportion of health care -- rests mainly with the county's Health Planning Council and the County Health Department. The ES area is presently served by an 83-bed General Hospital and a new private 80-bed skilled nursing home both in Kingman; community health clinics in Kingman, Bullhead City, and Dolan Springs; and an outpatient clinic in Bullhead City.

The ranch community uses existing medical facilities and services in the Kingman area when needed, but otherwise the ranchers do not concern themselves with medical insurance or improved and increased health care planning.

g. Social Well-being and Setting

This subsection is based on analysis of various reports and publications,[7-10] including a 1975 community attitudes report[11] of the Mohave County Planning and Zoning Commission which documented the findings of a mail questionnaire survey and of related citizens meetings, and on lengthy discussions in the study area with local government officials, representative citizens, and 18 of the 21 ranch permittees It reflects in general the values and life-styles of the ranchers and other area residents which, together with economic activities and public services, make up the community character.

(1) The Region and Its Communities. The image of Mohave County has long been characterized by the two developments of the latter half of the 19th century: mining and ranching. The discovery of gold in the mid-1850s brought the miners and the boom towns like Oatman, that at one time had a population of 15,000. Today, although the gold and silver heyday is past and the scattered mining towns remain only a skeletal reminder of the county's beginnings, mining continues to be a viable element of the region's economy, largely through the operations of the Duval Corporation.

Cattlemen arriving in the 1870s established an industry significant enough to attract the building of the transcontinental railroad through the county in the 1880s, and to establish Kingman as a shipping center. This provided access for Arizona beef to markets in California and the Midwest, and led to an influx of settlers and supporting businesses. The historical character of Mohave County was thus shaped and dominated by the ranchers and the miners and to a lesser degree by the townspeople.

Three major developments of the 1930s, undertaken by the Federal Government in the northwestern corner of Arizona, reshaped this historical image of Mohave County. These were the construction of the Hoover Dam at the northwestern bend of the Colorado River, and of the Davis and Parker dams farther south. These projects created Lake Mead, extending 110 miles behind Hoover Dam, Lake Mohave, with a length of 67 miles, and the 120-mile long Lake Havasu.

This change in the landscape, giving Mohave County 1000 miles of freshwater shoreline, offered new opportunities for growth and development which altered the county's economic and social profile. Unlike the earlier "rugged individuals," the new immigrants are primarily urban or semi-urban dwellers leaving the city and its abundance of services and problems and seeking a rural setting, healthful climate, and outdoor recreational opportuniteis. They seek a better quality of life which they hope to discover -- inexpensively -- in Arizona's open spaces, mountains, lakes, and clean air. They have brought with them the service industries, tourism and recreation, and have altered the composition of the population.

It is also evident from the above demographic and economic data (c above) that a significant portion of Mohave County's population are retired couples living on fixed, limited but adequate incomes, or younger members of the labor force engaged in low-paying service jobs. For either group, Mohave County holds a strong attraction to start or settle down to a life that is simple in material aspects but rich environmentally.

Social and political attitudes and expectations among the county residents are generally conservative and modest. There is a fierce spirit of independence and a strong belief in the freedom of the individual to manage one's own affairs and determine one's future -- a strong belief in local control and minimal governmental influence. These attitudes and convictions stem from the small town environment and strong sense of self-sufficiency.

A recent survey of Mohave County's residents[12] provides an insight into their values and needs. While it can be assumed that the ranchers did participate in this survey, and that the results provide some indication of their attitudes, specific responses are not known. It is apparent that the results largely reflect the people in the urbanized areas. The more important results of this survey relative to the proposed action were the priorities expressed by the Citizen's Committee for the Dolan Springs-Sacramento Valley. As shown in Table II-71 these citizens indicated some strong concerns about grazing activities and other land use actions that relate to the proposed action.

Other than the need for basic infrastructure improvements, a significant percentage of the population (37%) indicated in this survey that they are satisfied with the present condition of the community and prefer to retain the area as it is without further community services.

Residents in the generally urban areas of Kingman and Lake Havasu City opted to encourage more development in contrast to more remote communities such as Mohave Valley, Dolan Springs, and Sacramento Valley which preferred by 2 to 1 a no-development course of action. This position is borne out by the other findings of the citizens survey which showed that the most highly ranked factors influencing the decision to live in Mohave County are its rural atmosphere and climate.

(2) The Communities. The recent population growth has concentrated in three areas: Kingman, the Mohave Valley, and the Lake Havasu area. These areas are the focus of present and future economic planning and development. Beyond these areas are smaller communities which have also grown to some extent, but whose development and further growth are not anticipated inasmuch as they are not on major highways and lack direct access to recreational waterways.

The major communities in the impact area are Kingman, Chloride, Dolan Springs, Meadview, Sacramento Valley. Bullhead City, Oatman, Hackberry, and Truxton. There are other minor communities in various stages of development, but no specific profile on them has been compiled. The size of these communities is provided in Table II-27 and their location shown in Figure II-20. A more detailed description is provided in Appendix H and in Mohave County, General Development Plan.[13]

TABLE II-71

SUMMARY OF SELECTED CITIZENS COMMITTEE CONCERNS -
MEADVIEW-DOLAN SPRINGS-CHLORIDE

| Category | Ranking* | Number Voting** |
|---|---|---|
| Intergovernmental Relations | | (66) |
| Move cattle out of populated areas | 2 | 53 |
| Revise grazing law | 4 | 39 |
| Consolidate land ownership | 5 | 35 |
| Improve Pierce Ferry Road | 7 | 27 |
| Withhold development in exchanging lands | 16 | 6 |
| Natural Environment | | (66) |
| Revise grazing laws | 4 | 33 |
| Better control of floodwaters | 5 | 32 |
| Protect desert environment | 9 | 25 |
| Control of cattle waste | 15 | 12 |
| Economic Base | | (89) |
| Need roads into recreation areas | 7 | 43 |
| Environmental protection | 11 | 13 |
| Land Use | | (73) |
| Stricter laws for cattle grazing | 1 | 73 |
| Dirt tanks to conserve water | 2 | 64 |
| Better domestic animal control | 4 | 52 |
| Close some hunting areas to improve grazing | 8 | 43 |
| Recreation and Tourism | | (137) |
| Improve Stockton Hill Road | 1 | 137 |
| Improve Pierce Ferry Road | 2 | 129 |
| Better maintenance and roads to all recreational areas | 3 | 95 |
| Existing Joshua tree forest to become a national park | 10 | 67 |
| Provide area close to rural areas for rock hounding | 15 | 17 |
| Population | | (195) |
| Planned growth by the county for the county | 1 | 195 |
| Better maintenance of all roads | 2 | 184 |
| Consolidation of ownership pattern of checkerboard lands | 12 | 54 |
| Abolish the BLM | 13 | 17 |

* This ranking shows only those categories which relate to grazing and land use activities and does not show concerns expressed about other factors such as urban services. The ranking is given in relation, however, to these other factors.

** ( ) = highest number of voters.

Source: Mohave County Planning and Zoning Commission, Citizen Participation: Observation and Judgments, January 1975.

Further removed from the above areas of growth are the cattle ranches which have traditionally been self-sufficient and remote from population centers. Recent urban growth has had little impact on the life of the ranch other than providing a more abundant source of supplies, an educational center for the ranchers' children, and a trading center for livestock transactions. Conversely, the growth or demise of the ranch has, in the last decade, had little bearing on the planning goals and development activities of Kingman or other growth areas whose attention is focused on their own needs.

Today, the different elements in the region are more homogenous. The townspeople have increased in number and become more influential. Their emphasis is on providing services for the transient tourists and the in-migrating retirees. Further, the miners have become more a part of the community, taking up residence in the town while commuting to the mines. The ranchers, however, still live on and work the range. But the rancher, despite the prevalence of the image, no longer dominates the political or financial power base.

The townspeople in general appreciate the few remaining ranchers for maintaining the spirit of free enterprise through independent hard work. They carry an emotional attachment to the ranchers and see them as the last vestiges of the small family business. They further appreciate the historical role of the rancher in the beginnings of the county. The identification of the urban communities with the ranching image also gives the impact area a strong local pride manifest in young and old, as well as in newly-arrived residents.

Although their numbers have dwindled, the image of the rancher is stamped on the countryside. There is a strong feeling of pride and identification with the rugged, independent spirit of the country both among those whose ancestors date back to the first settlers and the new arrivals who have chosen to make Mohave County their home. Both have become more similar in dress, in thought, in life-style, and expectations.

(3) The Ranching Community and the Ranch. The impact area, with a population of approximately 23,000, has 21 permittees engaged in the management of 26 allotments.* Thirteen of these permittees own and live on a ranch, two live in Kingman, three reside elsewhere in Arizona, and three live outside of the state. This small community of ranchers is regarded by the townspeople as not necessarily wealthy, but as having the "good life" that reflects the romantic image of ranching that is generally held by non-ranchers.

Although a few of the ranchers maintain a home in or close to town, most of the ranch homes are 10-15 miles from the closest town. Contact with urban centers is maintained through the pickup truck, telephone, or radio phone, and sometimes a TV set. Light and water are generally provided by a generator and only those close to town have access to public utility systems.

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*There are actually 34 allotments in the ES area divided into 26 AMPs and eight custodial allotments under the proposed action described in Chapter 1.

Ranch homes vary in style from mobile homes to adobe houses that date back to the late 1800s. The interiors are comfortable but simple. The furnishings consist mainly of collected western memorabilia including antiques, artifacts, and mounted game specimens.

Households on the ranch consist mainly of the rancher's immediate family who make up the main source of labor for ranch operations. Only two of the larger ranches have hired hands who live on the ranch year round. Extra hands needed at roundup time are obtained on an exchange basis with other ranches, a non-salaried arrangement with aspiring cowboys, or on a temporary hire of an experienced cowhand and his horse. Year-round operations are maintained by the members of the family, each of whom contributes his fair share of labor. While the male head of the household manages the ranch, the wife often serves as the accountant and the purchasing officer in addition to handling domestic chores. Furthermore, it is the practice in most ranching families to give the children their own cattle and distinctive brand so that early in their life they learn about livestock grazing practices.

Most ranchers belong to the Mohave Livestock Association and their wives to the Cowbelles. A few of the more prominent ranchers are members of civic organizations such as the Elks, Rotary, Mason, or the Chamber of Commerce. Some are politically involved in the growth of the community and serve as members of local boards or commissions. Until recently, however, there was little interaction among the members of the ranching community; characteristically, each managed his own affairs and kept apart from the community. The proposed management actions of BLM have brought the ranchers together as a body to work as a single political entity. They have also become more involved with each other in terms of economic and personal problems and general well-being.

The rancher's outlook, like that of the community in general, is conservative and independent. It is derived from a 100-year history of self reliance in confronting the harsh elements of the western desert, of variable economic conditions, limited capital, and small tightly knit families. The land and cattle are a vital part of this life-style and they are close to both. They are open and friendly, yet do not take kindly to "outside" influences. For example, the relationship between the independent-minded rancher and the BLM is characterized by mistrust, dislike, and antagonism. In the ranchers' view, the BLM is not representing their best interests.

As indicated above, the majority (11) of the permittees have fewer than 400 head of cattle, the minimum number required to make a ranch economically viable (see d above). For some, the marginal operations represent a secondary source of income; in other cases, the ranch was purchased primarily for retirement. Interviews with the ranchers indicated clearly that strong attachment to the land and an unwillingness to live elsewhere are of far greater importance than the marginal aspect of their operations. Indicative of this is the fact that at least 15 of the permittees have another source of income.

Whatever their economic position, all of the ranchers interviewed strongly upheld the virtues of ranching. Even in adversity, most would "stick to ranching till they went broke," and would remain cattlemen while subsidizing the ranch with the income from other employment. Their comments support the conclusion of the Smith-Martin analysis of the socioeconomic behavior of Arizona cattle ranchers, ". . . that maintaining the ranch as a home and way of life is the rancher's most important goal -- provided he can find a way to survive financially in the local area."[14]

13. Institutional Setting

a. Roles and Responsibilities of the Participants

While there are numerous Federal, state, and local agencies that provide institutional services within the ES area, the focus of this discussion is on those agencies concerned with range management. For discussion of other agencies, see subsection 12 above.

(1) Federal

- Bureau of Land Management

The primary institution affecting both private interests and governmental activities and relationships within the Cerbat/Black Mountain area is the BLM. This agency of the U.S. Department of the Interior holds in public trust approximately 1,193,797 acres of land which is 47% of the lands within the Cerbat/Black Mountain Planning Area. Under existing commitments, most of this property is used by private landowners in connection with adjoining state and private lands as a grazing resource.

BLM has developed a series of allotment management plans, as described in Chapter I, for managing the public lands. The basic organizational unit for implementing these plans is the BLM grazing district (there are five such districts in Arizona) which has as its primary responsibility the administration of areas which are in intensive management use. Each of the districts is divided into resource areas which are further subdivided into planning units. The Cerbat and Black Mountain units are located in the Kingman Resource Area of the Phoenix District. The planning process which is the responsibility of the district office is described in greater detail in Chapter I. The personnel requirements associated with implementing the proposed action are also described in Chapter I and subsection 12 above.

- Soil Conservation Service

The second major Federal participant in the Cerbat/Black Mountain area is the Soil Conservation Service. Although the SCS is not a landowner, it affects the use of local lands because of the conservation plans it prepares in its role of advisory staff to the Natural Resource Conservation districts. In its inventory and soil survey services the SCS deals directly with the individual landowner and provides guidelines for soil conservation and utilization. In many cases, these owners are also allottees utilizing BLM lands.

In the past the SCS has entered into a memorandum of understanding with the BLM in an effort to undertake cooperative and complementary programs with the private landowners involved. If properties in a given planning area are between 35-65% publicly-owned -- e.g., BLM ownership -- cooperative planning for soil conservation, range utilization, and related

AMPs is undertaken. If more than 50% of the land in question is BLM land, BLM takes the lead in this cooperative planning effort. If the predominant amount of land utilized is in private ownership patterns, the SCS takes lead in the cooperative planning effort.

- National Park Service

Another Federal agency which has major landholdings in and adjacent to the ES is the National Park Service which administers the Lake Mead National Recreation Area. Historically, there has been an agreement between NPS and BLM that properties not being directly utilized for Lake Mead recreational activities can be used for cattle grazing. Under present policies, BLM must consider multiple-use potential for its leased properties which is not in concert with the traditional single-purpose basis for such agreements. This is reflected in the applicable cooperative agreement, which exists between BLM and NPS. At this time, however, it does not seem evident that potential alternative uses for the available NPS properties will be a point of major conflict in terms of the existing utilization of such properties for cattle grazing.

(2) State of Arizona

- Arizona State Land Department

The State Land Department is the trustee of the state lands. It is therefore responsible for preparing long-range plans relating to these lands and the classification of such lands for sale or lease. The department has planning authority over both water and land and, as a result, may make surveys and investigations relating to both of these resources.

In managing and leasing state lands, the department has traditionally, as stipulated by enabling legislation, had maximum revenue generation as a primary focus. The state, therefore, is inclined to base its determination of grazing capacity upon historic use, usually the previous 10-year annual carrying capacity. This emphasis can result in direct conflict with BLM's efforts to establish grazing capacities which will enhance the long-term improvement and protection of the range.

- Arizona Game and Fish Department

The department has as its primary responsibility the formulation of programs which will assure the preservation of wildlife within the state. The BLM must manage the habitat in support of department programs. Further, under the Taylor Grazing Act of 1938, forage must be reserved for wildlife, the remainder to be for domestic livestock grazing. The department, therefore, has impact upon the AMPs and the utilization of state lands, since it has the power to establish policies involving the creation of game refuges, fishing areas, and the protection of wildlife from water pollution. It must be anticipated that these responsibilities will bring the department into greater contact with both the State Land Department and BLM, as they both must consider the multiple-use potential of public properties.

b. Cooperative Agreements

In carrying out its current management plans and policies, BLM has entered into 16 interagency agreements since 1970. Eleven of these agreements are with other Federal agencies, four with the State of Arizona, and two with local governmental units. These agreements are summarized in Table II-72 and a complete copy of all agreements is available in the Phoenix District office. It is noted that these are essentially operationally oriented, addressing specific existing or anticipated problems but not comprehensive long-range planning needs. These may influence the management of the AMPs, or conversely, institution of the AMPs may affect the agreements.

(1) Federal Agencies. Two of the major agreements at the Federal level are the 1971 and 1973 agreements between BLM and SCS regarding planning and management coordination with local conservation districts. These also define the extent of operational assistance which would be provided by SCS in the development of any AMPs. Further, the 1973 agreement describes the operational assistance to be provided by SCS for BLM when the latter designs the AMPs.

Another agreement which may be of importance in the future is the 1975 agreement with USGS which establishes a procedure for a determination of responsibilities for onshore oil, gas, and geothermal operations. Assuming that BLM will pursue its multiple-use orientation in terms of utilization of BLM lands, it may establish the basic guidelines which will apply to possible alternative uses of existing grazing lands.

Another agreement of significance is the agreement with the NPS regarding the use of its lands for grazing purposes. The agreement allows for BLM jurisdiction only over grazing and not for other multiple uses as stated in the Federal Land Policy and Management Act of 1976.

(2) State Agencies. The agreements between BLM and state agencies focus on the consideration of environmental impacts as they relate to new construction and land use planning, the effect of Federal laws on wild animals and plants, and the management and improvement of the wildlife habitat.

There is not, however, any formal agreement between BLM and the State Land Department involving a cooperative and mutually satisfactory utilization of state lands and contiguous or proximate public lands. The state and BLM do maintain an informal liaison which addresses their mutual problems of the "checkerboard" private, Federal, and state ownership patterns and appropriate grazing capacities and management practices.

(3) Local Government Units. At present there are only two cooperative agreements between BLM and local government units. BLM has a cooperative agreement with the Big Sandy Natural Resource Conservation District involving the necessary coordination for conservation and resource development on public and proximate private lands. In this context, it is a relatively complex relationship involving BLM, SCS, and local government.

TABLE II-72

EXISTING BLM COOPERATIVE AGREEMENTS

| Federal Agency | Topic |
|---|---|
| 1. U.S. Army Corps of Engineers - 1972 | Construction and operation of water resource projects on/adjacent to public lands |
| 2. National Park Service | |
| 1971 | BLM administer/supervise grazing in Lake Mead National Recreation Area |
| 1972 | Designation of national landmarks on public lands |
| 1977 - draft pending | Supervision of livestock in Grand Canyon National Park lands |
| 3. Bureau of Reclamation - 1972 | Condition of planning projects between BOR/BLM |
| 4. U.S. Fish and Wildlife Service - 1966 | Carrying out of predator control projects on public lands |
| 1972 | Guidelines and procedures for animal damage control programs |
| 1976 | Interagency coordination in critical habitat determination |
| 5. Soil Conservation Service | |
| 1971 | Planning and management coordination within local conservation districts |
| 1973 supplement | Details operational assistance provided by SCS in development of resource conservation and AMPs |
| 6. U.S. Geological Survey | |
| 1975 | Determination of responsibilities regarding onshore oil, gas, and geothermal operations |
| 1976 | Contact U.S. Fish and Wildlife Service during various stages of geothermal lease processing |

The second cooperative agreement with local government is with Mohave County which provides for BLM to undertake corrective and preventive road maintenance programs on rights-of-way located on public lands.

c. Institutional Conflicts and Constraints

Considering the long history of BLM emphasis upon resource utilization and economic benefit to private users of public lands, it can be anticipated that the current stress on realizing the multiple-use potential of these lands will engender some difficulty within BLM itself. As has been noted in Chapter I, implementation of the AMPs will require both additional funds and personnel. Furthermore, BLM has had to seek out and employ personnel with different scientific and environmental disciplines. This change in BLM policies has also resulted in BLM enforcing stricter management controls on the public lands, much to the annoyance of the private user of the land.

Another result of this change in policy is that BLM, with ownership of approximately 47% (see subsection 11 above) of the land in the ES area, essentially dictates the extent of grazing activity upon both private properties and state-owned lands. This is a point of contention for owners of privately-held properties and also for state-owned properties. As indicated previously, the state does have as its primary obligation revenue production through the use of state lands. In times past there has been some disagreement as to the extent and intensity of grazing allowable under the differing assumptions utilized by BLM and the state. If private owners who are utilizing the higher capacity allocations of the state lands choose not to acquiesce in the reduced Federal guidelines, their option is to withdraw.

Although the State Land Department has indicated its willingness to cooperate in the mutually satisfactory determination of grazing capacity, it has acknowledged difficulty in reaching mutually satisfactory guidelines with BLM. For example, BLM has on occasion utilized as a minimal guideline for grazing no more than one to two head per property section whereas the state has utilized the minimal guideline for four head per section. Furthermore, the state legislature has recently passed the Cooperative Allotment Management Studies Bill. This bill indicated that the State Land Department should not adopt final management plans which involve reduction of use until the plan is reviewed by a joint committee of the State Senate and House.

The BLM and the SCS also utilize different systems of capacity classification for grazing. BLM typically utilizes a stocking rate average of six animal unit months per section whereas SCS first establishes the present condition of resources based upon the presence and comparative non-presence of cattle on the site. Based upon this assessment, SCS develops a trend line and an initial stocking rate. One year later it assesses the impact of the stocking rate on this trend line of forage utilization and provides the private landowner with recommendations concerning stocking rates for the next year. Since this grazing management system is advisory and not regulatory, SCS has occasionally allowed overgrazing of a given unit for a year so as to establish grazing management systems.

The major reaction that has been expressed by both governmental personnel and private citizens in these situations is the resentment toward the relatively powerful role of BLM in setting guidelines for grazing capacities. On the other hand, when the amount of lands which are in BLM trust and the more complex goals which BLM must pursue are taken into consideration, it is not unreasonable to assume that BLM will continue to establish grazing capacity guidelines which reflect more than a short-term concern for maximum utilization of existing resources.

One conflict which may become more important in the future is the extent to which ranching activities may come in conflict with the eventual utilization of the extremely large number of remote subdivisions existing in the ES area. It must be anticipated that if even a slow rate of development of some of these parcels does occur, the issue of containment versus the exclusion of livestock will become a concern of intense local interest. (See also discussion in subsection 7 above.)

A major concern at the local level is that privately-held properties will diminish in value with a concurrent loss in assessed valuation and revenues if BLM reduces grazing capacity by significant amounts. There is also concern that if the AMPs proposed by BLM result in more marginal ranching operations in Mohave County, there is a long-term likelihood that ranching as an economic activity would cease to exist. The loss is perceived as affecting both local government revenues as well as private interests.

## C. DESCRIPTION OF THE FUTURE ENVIRONMENT WITHOUT THE PROPOSED ACTION

The following section describes the possible future environment of the Cerbat/Black Mountain ES area for the next 15 years if the proposed action is not implemented. This condition assumes that the BLM management practices will continue in the same manner as in the past decade, that no new AMPs will be developed, and that the cattle stocking rate will be the same as in 1977, 7623 cyls. Resource trends that are discussed do not necessarily result from the absence of the proposed action.

### 1. Air Quality

Air quality for the area as a whole is expected to degrade in the future but not in any significant degree. Most of this will be due to sources and activities outside the study area. However, in certain specific locations the quality may diminish for short durations resulting from point source concentrations. This would most likely occur in the more urbanized areas such as in Kingman. In the next 15-year period, further deterioration of the range condition in some areas will result in more dust-blown particulates and related dust storms.

Taking into account range deterioration, agricultural tilling increases, and minor dirt road traffic increases, a 10-15% increase in particulate emissions in the ES area is assumed to take place over the next 15 years or so in the absence of the project. While the higher mean annual particulate level of 51 $\mu g/m^3$ is still under the state standard, the violations of the state 24-hour standard will increase from 7 to nearly 20 days per year.

The particulate emissions will increase to nearly 550,000 tons per year and about 50,000 tons per year over present conditions. Further, the valley areas (13 AMPs and six custodial allotments*) are expected to be more severely affected than the others located in the hills and mountains. Total wind erosion emissions in the valley areas will be nearly 435,000 tons per year, or about 40,000 tons above existing conditions.

Climatic conditions will not be affected by the continuation of present activities, except that the range with less ground cover will reinforce hotter and low-humidity conditions. The current precipitation pattern of significant variations above or below a 10-inch annual mean is expected to continue. This situation, which has run in unpredictable cycles and duration in the past, will continue to affect grazing activities and range conditions when combined with other factors and the lack of an appropriate management plan.

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*Part or full allotment numbers: 7A, 10A, 15A, 17A, 19A, 20, 27A, 29A, 30A, 34A, 42A, 56A, 71A, 24C, 32C, 48C, 59C, 74C, and 77C.

2. Geology and Topography

The geological and topographical character of the area is not anticipated to change in any significant or noticeable manner in the next 15 years.

3. Soils

The present condition of the soils is fairly stable and the sediment yield is categorized as low to very low and the erosion hazard as slight to moderate. The soil conditions, therefore, are expected to remain as is for the area as a whole. There is, however, an opportunity for certain localized areas in some allotments to undergo an acceleration in erosion effects as the range, without the proposed action, will deteriorate. Most of this continued damage would occur in those allotments identified as being in poor condition (see Table II-9) and which have been subjected to overgrazing. Other vulnerable areas will be the acreage around the existing 63 water sources on the 13 allotments and six custodial allotments in the valleys.

With the presence of less ground cover, additional erosion and sediment loss from increased runoff will occur, mostly in the drainage channels. As the frequency, location, and duration of storms are highly variable, it is not possible to accurately* determine increased sediment yield. Less coverage will also result in greater effects from sheet flooding erosion and allow for more adverse effects from wind erosion. These effects are, however, expected to be localized and to vary according to the variable climatic conditions typical of the study area. The estimated sediment yield based on BLM range data is expected to increase 10% or 69 acre-feet per year over present conditions. The ephemeral and custodial allotment yields are not quantifiable but it is assumed that they would also increase over time by 10%.

4. Water Resources

The assessment of environmental trends in a groundwater system requires a substantial data base that involves maintenance of water level and water quality records for a number of sites over a long period of time. Such records are virtually absent from the region encompassed by this report.

The only known environmental trends have been water level declines associated with localized municipal and industrial developments in the area and these are not expected to adversely affect water supplies. No basin-wide declines have taken place and the known local declines have caused little concern other than adjustments in pumpage rates and redistribution of withdrawal sites in the Kingman well field beginning about 1965.

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*K.G. Renard et al, Thunderstorm Precipitation Effects on the Rainfall - Erosion Index of the U.S.L. Equation.

Available water quality sampling, although grossly inadequate for quantitative assessment, indicates that no significant changes have taken place in the region in the historical past. This has occurred primarily because developments have been minimal and land use has not changed appreciably with time. Likewise, recharge rates, although highly variable from year to year, remain essentially unchanged because there has been no significant alteration of land use patterns in the area, nor is there expected to be any in the future.

5. Vegetation

a. General Description and Phenology

Without the proposed action, there will continue to be subtle changes in plant communities as woody species will continue to encroach into the grassland and shrub-grass disclimax communities.

b. Vegetative Condition of the Range (All AMP Allotments)

Information compiled on present range condition and apparent trend (Table II-9), would indicate that under present management there is a general decline in range condition within the total ES area. This is a cumulative condition including historical overstocking and improper livestock and resource management in more recent history. The present apparent trend is not quantifiable as there are no long-term vegetative trend data which can be used as a reference base to equate actual trend. On the basis of apparent trend, 5 of the 23 perennial base allotments show a stable to upward trend, 8 are down, with the remaining 10 designated as not apparent. Of these 10, several would appear to be downward on the basis of percentages of acreage in the poor to fair categories.

In general, without imposition of the proposed action, which includes marked range improvement considerations, there will not be an appreciable opportunity to improve the range condition and forage production of most allotments. Hence, over time the range will continue to deteriorate and ultimately livestock numbers would of necessity be drastically reduced.

c. Threatened and Endangered Plants

The threatened and endangered plants will continue to follow the general condition of the range as in the past. No definitive measurement of this effect can be made as there are insufficient data available for a proper assessment.

d. Poisonous Plants

In general, without the proposed action, those allotments presently in relatively poor to fair and showing an apparent trend of down or not apparent, could have an increase in toxic plants. This would be particularly true of the "sacrifice" areas that would expand with continuing

range deterioration. The types of poisonous plants that would tend to occupy additional space are those of an annual nature (careless weed, Russian thistle, cocklebur, and Solanum species, etc.), and such half-shrubs as snakeweed and Aplopappus species. With additional acreage occupied by toxic plants and less available range forage, the opportunity for the incidence of animal poisoning would be increased.

e. Ephemeral Range

Over the next 15-year period there will probably be little or no change in the ephemeral ranch condition. This will result from the three allotments being managed under the Ephemeral Range Special Rule now in effect. The actual condition is not quantifiable as no data exist for forecasting trends.

f. Custodial Management

The consequences of continued custodial management without the introduction of range improvement practices and no indication of a reduction in livestock numbers will be a continued decline in the range condition of these allotments, although this cannot be quantified at this time.

On the seven AMP allotments containing various proportions of custodial lands, continued use without the proposed action will result in a continuing decline in range condition. This would be particularly true on those allotments where livestock numbers are not controlled (Castle Rock, Canyon Ranch, and Ft. McEwen). The same opportunity for a decline in range condition exists on those allotments where fencing does not separate the custodial from the management portions of the allotments (Black Mountain, Castle Rock, and Canyon Ranch). The lack of a physical separation between custodial and management units on the same allotment can allow for an intermingling of controlled and uncontrolled livestock numbers which is not conducive to proper use of the allotment.

g. Vegetative Manipulation

Without imposition of the proposed action, those areas now designated for vegetative manipulation (705 acres of pinyon-juniper chaining and seeding on the Truxton Canyon allotment, and 1920 acres of blackbrush burning and seeding on the Mt. Tipton allotment) will remain only as candidate areas designated as having potential for such action in the future.

h. Riparian Habitat

The ES riparian habitats will continue to degrade in the same manner as the vegetative condition of the range discussed above.

6. Animals

Present range conditions and present land use patterns indicate a deteriorating trend in the productivity of the ES area's biotic resources. The region's low annual rainfall accumulations, combined with a continued high level of livestock forage utilization, will result in reinforcement of the downward trend condition.

As the ES area has been heavily utilized by domestic livestock for several decades, most of the wildlife resources have probably stabilized at low densities and diversities. However, many native organisms are extremely sensitive to intense livestock grazing and will continue their gradual population declines until such species cease to exist within the ES area.

a. Mammals

The bighorn sheep and pronghorn populations now appear to be stable, while mule deer are apparently declining in number. Without the proposed action the mule deer will continue to decline and as the forage resources continue to decline, sheep and pronghorn numbers may also be negatively affected. The population trends for the other mammalian groups are unknown.

b. Wild Horses and Burros

No change is expected in the population density and distribution of the wild horses of the ES area as they have remained stable for several years under the existing condition. The wild burros, however, will continue to increase at a rate of 10-30% annually until such time as they have depleted their food supply and destroyed the range.

c. Birds

Upland game birds and most perching birds will not be expected to change significantly in population size and distribution since their numbers have remained relatively stable through many years of heavy livestock grazing. Most species of perching birds inhabit dense stands of chaparral, which consist of resilient plants that are generally resistant to livestock grazing.

Although pre-grazing density data are unavailable, predatory birds, including golden eagles, zone-tailed hawks, red-tailed hawks, screech owls, great horned owls, and prairie falcons, will probably continue to inhabit the region but may be prevented from achieving their natural abundance.

Waterfowl would also be unaffected by continuing the present livestock grazing practices. Shorebirds, ducks, and geese only utilize ES area water sources as resting sites during migration and are unaffected by the area's range condition.

d. Amphibians

The fate of the amphibian of the ES area is dependent upon the existence and preservation of the riparian habitats. Under the present grazing system these habitats are believed to be deteriorating.

e. Reptiles

Population declines of unique reptiles, such as the Gila monster and the desert tortoise, will continue due to habitat loss and direct forage competition with livestock. Extinction of these two species within the ES areas very likely will occur.

f. Invertebrates

The future trend in invertebrates is difficult to quantify as information on their populations and habitats in the ES area is lacking.

g. Threatened and Endangered Species

Information concerning the endangered peregrine falcon and bald eagle habitat requirements and population trends within the ES area is lacking. Therefore, the future effect of continued livestock grazing on these two raptors is unknown.

h. Riparian Habitat

As the riparian habitats continue to decline the riparian animals will find it more and more difficult to find adequate habitat. The current lack of data makes definite assessments difficult, However, without riparian habitats the animal component dependent on them may disappear from the ES area.

7. Land Use

a. Land Use Characteristics

The principal land use within the study area, grazing, is expected to remain in the same relative acreage as present. The checkerbroad pattern will probably continue. Any exchanges, however, that do occur will be predicated on variable political, economic, or environmental considerations that do not lend themselves to accurate predictability. The four custodial allotments (24C, 48C, 72C, 77C) containing 19,614 acres and designated for transfer (see Table I-12) will most likely change ownership but not grazing use. The exchanges are not expected to diminish the presence of the BLM in the management of public lands for multiple-use purposes and will not alter the land use. Other BLM land use classifications are not expected to change in any significant amount.

In relation to urban subdivision or expansion, the Mohave County Planning and Zoning Commission estimates that only 8.3% of the existing subdivided acreage will be needed in the future. This use would require only an additional 20 square miles of land out of the 402 square miles currently subdivided, which includes the 13.4 square miles already in use. The urban population by the year 2000 will require 21.4 square miles of the 52.7 square miles of current subdivided land found in the major centers of urban concentration. Most of this growth will only minimally affect grazing to the extent these lands are fenced. Other land uses for rights-of-way, etc., are not expected to change in any significant amount.

The county's attempt to diversify its economic base and to effect land use controls will continue. Most likely this will result in industrial, tourism, and service activity increases in the urbanized areas of Kingman and Bullhead City. These developments will not involve the use of public grazing lands, nor, very likely, private grazing lands. Tourism development will affect the communities along the river as noted above, and possibly Cottonwood, Willow Beach, Bonnelli Bay, and Temple Bar. This may result in the exchange of some of the transfer lands identified in Table II-30 and result in some minor and unpredictable changes in land use.

b. Recreation

The continued downward trend in range condition will see a decrease in recreational activities, principally hunting. The assumption is that the ES area will still be available for recreational use in the same areas as now, but that its attractiveness will decrease. The major recreational land use in the area, Lake Mead National Recreation Area, will continue to dominate and not be affected by range conditions.

It is difficult to think that under continued trends activity forecasts will be realized. While residents in the area have indicated a desire to have recreational facilities and areas expanded, the condition of the range may negate this desire.

c. Agriculture and Forest Products

Forestry activity and various forest product developments are not major land uses in either the Black Mountain or Cerbat Mountain Planning Units. Similarly, agricultural activity within the study area is minimal. so that neither activity can be considered a potential major land user in terms of future growth or competing activities. Moreover, it is unlikely that agricultural activities on a large scale would be introduced into the planning area because of the pervasive lack of a suitable irrigation system and an easily accessible low-cost water supply.

d. Livestock Grazing

The current land use pattern of livestock grazing is not expected to change in the next 15 years without the proposed action. While there may be some changes in ownership due to land sales and exchanges of land, such lands are expected to be used for grazing.

Without the proposal, present livestock management practices (herds of cattle, cow/calf operations, breeding practices, seasons of use, shipping dates, culling practices, etc.) will remain unchanged. The use of supplemental feed may become more necessary if the combination of deteriorated range conditions and several seasons of low rainfall occurs.

e. Mineral Resources

The minerals of the ES area have been and will continue to be explored, developed, and extracted. The development of many of the minerals and of geothermal energy may become more economically feasible within the foreseeable future.

The areas from which minerals could be extracted are for the most part outside of usable grazing lands except for some sand and gravel operations. This latter activity would be at the most 10-15 acres and would be located at the fringes of the grazing areas. Salt mining at Red Lake could exist along with cattle grazing.

f. Transportation

The improvement of the transportation network in Mohave County over the next 15 years will probably be in accord with the proposal of the County Planning and Zoning Commission. These improvements will be primarily directed toward maintenance and upgrading of existing roads. They will minimally affect or be affected by grazing activities. While they will improve access and circulation for existing and new residents and increase recreational opportunities, they will not result in any major land use changes.

8. Natural Hazards

The potential for natural hazards to increase in the near future will relate directly to the condition of the range. The flooding potential will probably be greater as there will be less vegetative cover, allowing for increased runoff and wider dispersal of sheet floods. The magnitude and occurrence of floods, however, is derivative of rainfall intensity, duration, and location which varies considerably above and below a mean of 9-10 inches annually. The extent of increased flood hazard, therefore, cannot be estimated with any degree of assurance.

The allotments having the greatest potential for flooding will be Big Ranch, Black Mountain, Clay Springs, Canyon Ranch, Crozier, Curtain, Gediondia, Music Mountain, Upper Music, Silver Creek, Pine Springs, and the custodial allotments of Cook Canyon, Jones Spring, and Peacock Mountain. The Truxton Wash area will continue to have the highest potential for flood damage.

The fire hazard most likely will not change significantly. The present condition is not considered severe and with a continued degradation of the range condition the fire hazard is lessened to a certain degree. While reduced vegetation lowers the fire hazard, the potential for dust storms increases primarily in the valley areas, particularly the Hualapai Valley/Red Lake area.

## 9. Cultural Resources

Artifact damage from the trampling actions of cattle is expected to continue to occur and increase at nearly the same frequency and extent as in the past. As noted in the discussion on existing conditions, the survey results indicate that the cultural resources are in generally fair condition. This resource will also be adversely affected by further deterioration of the range condition, particularly from the effects of erosion and vandalism.

## 10. Natural Environmental Areas

The principal effect on the natural areas if the proposed action is not implemented will be the lack of protection. The natural areas and those areas having primitive values identified in Chapter II will probably not receive the necessary support of the BLM and therefore not be adequately set aside or appropriately managed. The scenic areas will not be as adversely affected since no new improvements will be constructed and grazing levels will be reduced. With the projected increases in population and increased access to the more remote areas, the quality and uniqueness of some areas will be diminished. This will be particularly true if ORV areas and regulations are not identified, designated, and enforced.

The areas having potential wilderness value and those of critical environmental concern will also suffer because of the high grazing level and increased competition for forage. It is expected that the cattle will begin to reach into more remote areas thus threatening the value of such areas. It will also depend upon the extent to which BLM develops protective management plans as required under current legislation. This will mostly affect five allotments as noted in Table II-55.

## 11. Visual Resources

The visual character of the existing landscape will remain the same without the proposed action. The mountains, valleys, steep cliffs, and canyons with sparse vegetation will still be readily visible and continue to provide the area with its remote, natural quality.

If current grazing conditions coupled with low rainfall continue, a gradual decrease in vegetation cover will occur. This change, along with wind erosion, will modify the texture, form, and color of the existing landscape. The scenic quality evaluation ratings for the valley areas will drop and lower the scenic quality class. Visual sensitivity levels, however, are not expected to change as no new improvements will be built.

## 12. Socioeconomic Conditions

### a. Demographic Characteristics

The Arizona Office of Economic Planning and Development (OEPCD) estimates that by 1990 Mohave County's population will be approximately 57,300. Other estimates suggest a population as large as 164,000, which appears

to be questionable based on assumptions concerning the percentage of new in-migrants to Mohave County as shown in Appendix H. Therefore, for the purposes of this report, the population projection of 57,300 is considered reasonable as shown in Table II-73.

The makeup of this population will follow trends established during the 1960-75 period. The older age groups may become somewhat more predominant in the population, and there will be no significant increase in the number of minority residents. No change is anticipated in either the size or characteristics of the ranching community either because of the proposed action or factors other than grazing.

b. Employment

The OEPD has made employment estimates to correspond with its population forecast. By 1990, it expects employment in the agriculture sector, which includes both farming and ranching, to decline from 225 persons to approximately 175. Agriculture is the only sector in which employment will decline in both the state and Mohave County.

The greatest increases in employment will occur in the wholesale and retail trade, manufacturing, services, and government sectors. In 1990, the county's primary basic economic activities will be mining, tourism, retirement, and related services. However, mining will become less significant as there will be only a minor increase in total mining employment.

c. Income

Total personal income in Mohave County is expected to increase from $150 million in 1976 to $289 million by 1990, or by 93% over 14 years. However, the rate of growth in personal income will be somewhat less than the rate of growth statewide, indicating that the in-migrants to the county will have lower incomes than in-migrants settling elsewhere in the state.

d. Livestock Grazing Activities

(1) Ranch Characteristics. The total number of ranches in the ES area is expected to remain the same. Although there has been some indication given of a willingness to sell in the interviews with ranchers, it cannot be assumed that there would be any decrease in ranching activity.

There will be 11 permittees with less than 400 cyls and seven permittees with more than 400 cyls. The eight custodial managed units will not change nor will the three ephemeral allotments. Furthermore, the stocking level will remain at 7623 cyls.

TABLE II-73

MOHAVE COUNTY AND ARIZONA POPULATION PROJECTIONS
1976-90
(thousands)

| | 1976 | 1980 | 1985 | 1990 |
|---|---|---|---|---|
| Mohave County | | | | |
| Arizona Office of Economic Planning and Development | 39.4 | 44.0 | 50.8 | 57.3 |
| Mohave County Planning and Zoning Commission* | 39.4 | 63.3 | 101.9 | 164.1 |
| Mohave County Planning and Zoning Commission** | 39.4 | 67.0 | 85.3 | 115.0 |
| Arizona | | | | |
| Office of Economic Planning and Development | 2,270.0 | 2,569.4 | 2,934.9 | 3,303.7 |

*Based on estimates prepared by the department using a 9% annual growth rate for the county. Community estimates are based on the percentage of county population. Kingman comprised 38% of the population in 1974, and these estimates assume that Kingman will continue to make up 38% of the county population in 1980, 1985, and 1990. The percentages for the other communities are Lake Havasu City, 28%; Upper Mohave Valley, 16%; and Lower Mohave Valley, 6%.

**Based on estimates prepared by the department using a growth rate based on building permits issued. Community estimates are as described in the note above.

The small ranch units (less than 400 cyls) will still subsidize their operation with other sources of income and the rancher will stay close to the land because it provides "a way of life." Essentially, the rancher will continue to operate as described in Section B-12 above. The only difference will be in the condition of the range resource. For 17 allotments the condition will continue to show a downward trend, and for six allotments the upward trend will be moderated and perhaps negated.

(2) Cattle Shipments, Market Characteristics, and Sales. The pattern of cattle shipments and sales for Mohave County is not expected to change significantly in the next 15 years. Cattle shipments will be the same, but the exact numbers will vary each year, depending on market conditions. Cattle weights, however, are expected to decline on the average about 5% as forage production is expected to decrease.

Cattle prices will continue to follow the 10-year cycle typical of the past, ranging from an average of $27-58 per cwt.

(3) Herd Inventory Value and Composition. Assuming a continuation of the current livestock stocking of 7623 cyls, the total ES area herd composition and value will be $1.9 million (Table II-74). Further, there will be 1677 sale cattle valued at $267,200 at an average price of $159 per head.

In comparison, the total herd composition and value at present is $1.97 million with 1677 sale cattle valued at $301,200 or $180 per head.

(4) Ranch Value. The estimated value of the ranches in the ES area will decrease from $7.62 million to $7.47 million, with the land value estimated to be $3.48 million, improvements at $1.61 million, cattle at $1.92 million, and machinery at $460,000. These estimates do not reflect any normal appreciation in land values, the influence of any speculative real estate market activities, or depreciation in equipment. The reduction in land value from the current $3.58 million is a direct reflection of 5% loss in cattle weight of the sale cows.

(5) Economic Operations of the Ranch. The return for the average size ranch in the ES area without implementation of the AMPs is estimated to be a loss of $2,700. This is based on 331 cyls*, $100 O&M costs/cow unit, and a 65% calf crop as shown in Table II-75. The current average ranch size as discussed previously had 331 cyls and showed a loss of $210. It can be seen, therefore, that the economic position of these ranchers will at best remain the same and more likely decline. In combination with a loss in the value of the herd and the ranch of $170,000 from current value, and the generally poor range condition, the position of the ranches cannot be considered favorable.

(6) Induced Effects of Ranching. The trend in direct and indirect ranch-related employment in the ES area will be stable in the next 15 years, and remain at about 50 jobs. Similarly, ranch expenditures in the county are expected to remain the same as now, $368,000. The total induced income in this period will be $95,810 and total income, ranch and induced, will be $312,000.

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*7623 cyls divided by 23 allotments.

TABLE II-74

TOTAL HERD COMPOSITION AND INVENTORY VALUE, 23 ALLOTMENTS - FUTURE TREND, STOCKING RATE WITHOUT PROPOSED ACTION

| Herd Composition | Cyl | Price per Pound | Weight (lbs) | Value |
|---|---|---|---|---|
| 50% Producing Cows | 3,812 | 22¢ | 1,000 | $ 838,600 |
| 20% Replacement Heifers | 1,524 | 37¢ | 570[a] | 321,400 |
| 5% Bulls | 381 | $400 each | | 152,400 |
| 3% Horses, Milk Cows | 229 | $300 each | | 68,400 |
| 11% Steers (sale type) | 839 | 40¢ | 494[a] | 165,800 |
| 8% Heifers (sale type) | 610 | 34¢ | 413[a] | 85,700 |
| 3% Cull Cows | 228 | 20¢ | 800 | 36,500 |
| Subtotal | 7,623[b] | | | $1,668,800 |
| 50% Heifers[c] | 1,010 | 40¢ | 285[a] | 115,100 |
| 50% Steers[c] | 1,010 | 48¢ | 285[a] | 138,200 |
| Subtotal | 2,020 | | | $ 253,300 |
| Total | 9,643 | | | $1,922,100 |

a. 5% loss in current weights.
b. Includes cyls for custodial lands within the 23 allotments.
c. Calves one day old to yearlings based upon 65% calf crop for producing cows and replacement heifers, less sale-type steers and heifers.

Sources: Arthur D. Little, Inc., estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

TABLE II-75

AVERAGE RANCH EXPENSES AND RECEIPTS -
FUTURE TREND, STOCKING RATE WITHOUT PROPOSED ACTION

| Summary of Expenses | Percent of Total O&M Budget | O&M Costs* |
|---|---|---|
| Overhead | 23.2% | $ 7,700 |
| Labor | 15.3 | 5,100 |
| Machinery | 20.5 | 6,800 |
| Material | 12.3 | 4,100 |
| Custom Services | 1.5 | 500 |
| Interest | 9.0 | 2,900 |
| Depreciation | 18.2 | 6,000 |
| Total | 100.0% | $33,100 |

| Herd Composition | 65% Calf Crop |
|---|---|
| Cows | 282 |
| Replacement Heifers | 34 |
| Bulls | 15 |
| Market Steers | 92 |
| Market Heifers | 58 |
| Cull Cows | 28 |

| Receipts | Weight (lbs) | Price per Pound | Number of Head | Total Price |
|---|---|---|---|---|
| Cows (cull) | 800 | 20¢ | 28 | $ 4,480 |
| Bulls (cull) | 1,100 | 30¢ | 3 | 990 |
| Heifers** | 413 | 40¢ | 58 | 9,580 |
| Steers** | 494 | 34¢ | 92 | 15,450 |
| Total Receipts | | | | $30,400 |
| Total Ranch O&M | | | | $33,100 |
| Profit (Loss) | | | | $(2,700) |

*331 cyls with $100/cyl O&M cost.
**5% reduction in current weights.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

e. Government Revenues

Based on the current fees of $1.51 per AUM, and the stocking rate of 62,571 AUMs, the revenue from grazing fees in the ES area will be $94,500. Under the new BLM rules, the amount available in the ES area for range improvements will be $23,600 annually.

The revenues to the state are expected to remain at about $6,000-7,000 assuming no land exchanges. While the rental rate is based on grazing use levels and carrying capacities that would indicate they would decrease, they also reflect market conditions which are difficult to predict with any accuracy. Thus, the rates the state may set in the future are not determinable.

The assessed valuation of the ranches is expected to decrease by $30,000 to $1.34 million. Based on a property tax rate of $8 per $100 of assessed value, the tax revenue will be $107,600 or $2,000 less than at present.

f. Support Facilities and Services

Rancher use of public services will continue to be minimal and have little effect on public support facilities and services. These facilities and services will continue to focus on the needs of the principal recipients or users -- namely, the residents of urbanized areas and the seasonal tourists. The emphasis on diversifying the economic base of Mohave County to provide sufficient employment for its growing population, as well as the efforts to promote and serve the tourist trade, will place additional demands on the expansion of basic local services. The most critical of these will be local transportation and water/sewer systems. Increased sources of water supply and wider distribution systems will be required not only for the personal/domestic needs of a growing population but also for increased commercial facilities and leisure developments.

The different levels of Federal, state, county, and city agencies providing public services within Mohave County will undertake modest expansion of staff, facilities, and equipment. The county will continue to bear the greater responsibility for the provision of local services. Special social services in the ES area will be developed in direct relation to the growth of specific groups, such as the retirement communities rather than the ranch community.

g. Social Well-being

Although the most significant growth of Mohave County is considered to have taken place between 1960 and 1975, there will be steady growth as the county's climate and environment continue to attract both young and old. Retired people will continue to settle in communities already characterized by their elderly population. In addition, new subdivisions which are presently unoccupied will be populated. Some old communities that have shown declining populations, such as Chloride, may eventually die out. Other communities such as Hackberry, Valentine, and Truxton face an uncertain future with the completion of I-40.

The growth of the tourism and recreational industry will determine the future of the shoreline communities and of Kingman. The county will probably concentrate its planning and economic development efforts on the diversification of its economic base around the urban centers and on the promotion of open spaces and their recreational potential.

The influence of the ranching community on the county's development as a whole will continue to diminish in direct proportion to the growth in other economic sectors. Furthermore, as daily concerns of the area residents' own economic existence press upon them, and as the present disagreements between ranchers and the BLM most likely diminish in intensity without the proposed action, the communities of Mohave County will feel less and less the presence of the ranching community.

The increased costs of operating a ranch, as discussed in Section B-12d above, may cause some of the marginal operators to fail. From discussions with the ranchers, it was indicated in most cases that, under these conditions, they would stay on the land and maintain their life-style. Further sources of income may be sought (as is already done) but this would be done locally and would not involve any new skills, training, or education. Three of the ranchers did indicate a willingness to sell but it cannot be assumed that this would occur.

There will be little or no change in the conservative values and life-styles of the ranchers. They will continue to stay close to the land and focus on their own immediate concerns and ranch operations. Very few, if any, will sell their land since ranching as a way of life is more important than economic gain or seeking other options, skills, or places to reside. The rancher will be concerned with increased population and concomitant recreational use of public lands only to the extent that vandalism occurs more frequently. In general, the rancher will remain uninvolved.

13. Institutions

Without the proposed action the BLM will essentially continue to operate as it has in the past five to ten years. While the multiple-use policy will be maintained, it is expected that the implementation of the policy will proceed more slowly and that management plans will come into effect only gradually. The involvement of the BLM with the ranchers will still occur although it will not be as intense or as involved as at present.

The further deterioration of the range will pose a dilemma for the BLM. Without the proposed action it is assumed that the management of the public lands will be at a low key, and yet by statute BLM is mandated to protect the resource. Outside political and environmental pressures to correct a declining condition will probably intensify. Adding to this situation is the expectation that the management of the lands for wildlife, natural environmental areas, scenic and visual resources, and recreation will also not be effectively accomplished as the past history of protecting the resource has not been notably successful. While the BLM has improved its management practices and approaches to conservation since 1973, there is

no positive assurance of accomplishment without the proposed action since trends in staffing and budget resources have and will continue to limit BLM's actions. The concomitant use and protection of the rangelands will continue to lie with the land user. This situation will no doubt place the BLM in an untenable and highly criticized position in regard to the maintenance of a public resource.

The costs of range improvements and the need for additional BLM personnel, as identified in Chapter I, will not be required without the proposed action. The survey of range conditions, the determination of grazing capacities and AUMs, and the issuing of permits, etc., will still be accomplished. This will require a continued expenditure of public funds at approximately the same levels as now aside from inflation.

The agreements between BLM and other governmental institutions will still be in force. Some of the issues and conflicts and attendant political pressures will probably diminish with the less intensive role of the BLM relative to land disposal, uncontrolled lands, grazing capacity determination, and the omnipotent presence of the Federal Government. With the state tending toward improved management of its lands, there will be greater agreement with the BLM on implementation methods. Land disposals and exchanges are also more likely to occur among the state, the BLM, and the private landowner.

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14. A.H. Smith and W.E. Martin, Socioeconomic Behavior of Cattle Ranchers, with Implications for Rural Community Development in the West, American J. Agr. Econ., 54(2):217-225, May 1972.

# III. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

## A. IMPACT ASSESSMENT AND THE PLANNING PROCESS

### 1. Planning Assumptions

A number of basic assumptions have been made by BLM in designing the proposed AMPs. These assumptions, as listed in Table III-1, were derived by BLM from their policies, knowledge of the ES study area, and range management practices. They are discussed in this chapter wherever they affect the determination of an impact or the outcome of a probable impact. In several instances, the beneficial or adverse aspects of the proposed action depend on the reliability of these assumptions and in other instances they affect the successful implementation of the AMP.

Assumptions 1 and 2 are the focus of the AMPs and are addressed within the context of the ES. Assumption 3 is similarly addressed in subsections 5 and 7 below. It is noted, however, that direct application of the rest rotation systems is limited in the short term and will require a gradual approach and longer-term introduction than proposed in order to succeed. It is further noted that BLM has proposed, and can make use of, a deferred grazing system to gradually introduce rotation practices without shocking the range environment and to allow for adjustment to new situations by the livestock.

In reference to assumption 4, it is noted that there are neither a sufficient existing survey nor long-term data to establish a usable description of the ephemeral range. Similarly, the descriptions of the factors used in forage area requirements (FAR) range conditions and determinations are not complete (assumptions 5, 6, and 8), particularly as they relate to the custodial and ephemeral allotments. As discussed in subsection 5 below, further site-specific information is needed to fill out and verify the current information. While informed judgments can be made at this time, further analysis is required.

The wildlife population (assumption 7) estimates for each allotment need further verification on-site to substantiate the effects of wildlife grazing and the livestock/wildlife competitive factor. This is particularly true in relation to deer, burros, and wild horses.

The use of 60% of the forage in any pasture may be difficult to establish in the early stages of rest rotation implementation. Both assumptions 9 and 10 will have to be closely monitored to achieve desired results even with the proposed reduction in licensed AUMs. Moreover, the varied climatic conditions may result in greater use of flexible management practices than anticipated in the proposed action to establish a rest rotation system.

The capabilities of the allottees (assumption 11) to implement the AMPs is in serious doubt, as discussed in subsection 12 below. Without recognition of this factor, the proposed action could certainly be delayed and result in a different BLM approach, as discussed in Chapter IV, Mitigating Measures, and Chapter VII, Alternatives. Similarly, BLM capabilities

TABLE III-1

AMP PLANNING ASSUMPTIONS

1. The existing livestock grazing and land use practices in the ES area are in need of modification and improved management.

2. Controlled or managed livestock is a non-degrading, suitable use of public lands in the ES area.

3. The range and climatic conditions of the Cerbat/Black Mountain study area are suitable for initiating and maintaining a rest rotation grazing system.

4. The identified ephemeral range is not deteriorating under present range use.

5. The data on species composition, plant density, soil surface factors, and actual livestock numbers are sufficient for a usable FAR determination.

6. The livestock grazing capacities, or AUMs, and range descriptions reflect actual environmental and range conditions and are not exceeded.

7. The wildlife and burro and wild horse densities for each AMP are sufficiently accurate.

8. The collected BLM data from the URAs and MFPs are sufficient to evaluate the impacts on the natural resources.

9. Only 60% of the available forage will be utilized in any one pasture.

10. Flexible management by opening pasture gates will be rarely used in the long term.

11. The present allottees have the fiscal and physical capability to implement the proposed AMPs.

12. BLM will have the capability and resources to implement and administer the AMPs and manage the allotment.

and past history of range management are not harbingers of success in the ES area when historical use patterns are examined. Moreover, the three allotments already with AMPs -- Music Mountain, Upper Music, and Crozier Canyon -- are not in good condition. The implication is that BLM will have to make additional management and range monitoring as well as fiscal commitments to achieve its desired results.

2. Impact Assessment Summary

The probable impacts generated by the proposed action are described in the present chapter (III). These impacts are described in terms of the effects on the environmental elements as presented in the description of existing conditions in Chapter II. Each element is analyzed according to four primary actions, as presented in Chapter I, Description of the Proposed Project. The components of each of these actions are:

- Grazing Systems

  a. Santa Rita
  b. Three-pasture rest rotation
  c. Four-pasture rest rotation
  d. Deferred
  e. Custodial
  f. Ephemeral

- Water Developments

  a. Springs
  b. Wells
  c. Catchments
  d. Pipelines
  e. Troughs
  f. Storage tanks
  g. Reservoirs

- Range Improvements

  a. Fences, including cattleguards
  b. Corrals
  c. Roads and trails

- Vegetative Manipulation

  a. Chaining and seeding
  b. Burning and seeding

The impacts resulting from water developments and range improvements in some instances are considered together with the impacts resulting from the construction of improvements. Those elements that are only minimally affected or not at all are geology, topography, soils, water resources, land use, and institutions, and are only briefly discussed. Use of water sources and sufficient rainfall are essential, however, to any effective range management program. The elements receiving the most significant

impacts are vegetation, animals, cultural resources, and socioeconomic conditions including range and livestock land use and grazing activities. Furthermore, there are several areas considered to be critical areas of environmental concern (see subsection 10) that require more detailed survey analysis and possible protection.

## B. IMPACTS ON ENVIRONMENTAL ELEMENTS

### 1. Climate and Air Quality

#### a. Air Contaminants - Contribution of the Proposed Action

The project will result in very few non-particulate emissions and in no case are these expected to have a significant impact on ambient air quality. On the other hand, as noted in Chapter II-B1, particulates do cause violation of state and Federal standards within the broad region of northwestern Arizona and Southern California and Nevada. The project's potential to aggravate or ameliorate this presently unacceptable air quality condition for particulates is discussed in the following analysis.

The proposed action will have a significant impact on the generation of particulate matter in the Cerbat/Black Mountain area. This impact will be less than present due to the generally greater vegetative cover that can be sustained under the proposed action. The AMPs will directly increase particulate generation, but this will be of short duration and minor extent. The air quality of this area, however, will continue to be influenced by sources outside of the study area and independent of BLM actions.

The methods of impact calculation for the various sources affecting the study area are presented in Appendix I. A summary of all particulate emissions with the project and compared to existing conditions and an ungrazed range condition is presented in Table III-2. A discussion of dust generation of the open range under the proposed action and the relationship between vegetative cover and particulate emissions follows. Lastly, there is a discussion of particulates generated by other study area sources, such as vehicles, mineral extraction, and power generation. It is noted that the reduction in emissions is based on the changes within the 26 AMP allotments. The eight custodial allotments are expected to experience an increase in emissions as no management is proposed. The three ephemeral allotments are not expected to experience any change.

Although the effect of the proposed range management plan would be to decrease particulate emissions in the ES area by about 6% (see Table III-2), the concurrent worsening of ES area particulate burden through other sources, such as agricultural tilling, serves to mask the project's beneficial effect somewhat. Put the inverse way, the project will exert its beneficial effect by lessening the deterioration of the ES area's particulate burden. From Figure I-1, in Appendix I, it can be seen that the geometric mean of particulate concentration in the future would be 48.4 $\mu g/m^3$, or 4% higher with the project, versus 10% higher without the project. With the project, the state annual standard for particulates would still be met although violations of the state 24-hour standard would increase from 7 at present to 10 with the project. Thus the impact of reduced grazing would be to offset partially the increase in particulates which will probably be contributed by other sources such as agriculture and traffic on dirt roads.

TABLE III-2

PARTICULATE EMISSIONS SUMMARY
(tons per year)

| | Existing[a] | Project[b] | No Project[c] |
|---|---|---|---|
| Direct | | | |
| Construction[d] | 0 | 9.6 | 0 |
| Chaining[e] | 0 | 63 | 0 |
| Burning[e] | 0 | 6,528 | 0 |
| Indirect | | | |
| Wind Erosion | 395,400 | 359,000 | 288,300 |
| Ancillary | | | |
| Vehicles | 100,710 | 100,710 | 100,710 |
| Point Sources | 140 | 140 | 140 |
| Total | 496,250 | 466,451 | 389,150 |

a. Existing condition without proposed action
b. Condition with proposed AMPs.
c. Condition without livestock grazing.
d. Total 38.4 tons over four years.
e. Chaining and burning actually scheduled for different years.

Note: The emissions compared here are those of the project and of the hypothetical ungrazed range set purposely "in a vacuum"; the effects of external pollution sources are not included so that the impacts of the project itself and of grazing in particular may be separated out. The effect of other pollution trends is considered in this subsection.

Source: Arthur D. Little, Inc.

(1) Grazing Systems. By far the greatest source of particulate matter, or dust, in the Cerbat/Black Mountain area is the dry windswept desert itself. The actual quantity of dust released is a complex function of many variables, several of which are directly affected by man and are affected by the proposed action. The calculation of dust emissions is based on U.S. Environmental Protection Agency (EPA) studies and discussed in Appendix I.

Because the various factors of the wind erosion equation (see Appendix I) are specified differently for the three different environments, there is a substantial difference in wind-borne dust among valleys, foothills, and mountains. The expected emissions are presented in Table III-3. The

## TABLE III-3

## WIND EROSION EMISSIONS

| | Valleys | Foothills | Mountains | Study Area Total | Emissions Comparison |
|---|---|---|---|---|---|
| Acreages | 784,500 | 668,900 | 448,600 | 1,902,000 | |
| No Project | *.31* | *.07* | *.0008* | | Project |
| | 241,626 | 46,335 | 336 | 288,317 | No Project =1.25 |
| Project | *.35* | *.12* | *.0010* | | |
| | 276,144 | 82,408 | 449 | 359,001 | |
| Existing | *.37* | *.15* | *.0013* | | Project |
| | 291,834 | 103,001 | 561 | 395,406 | Existing =.91 |

Notes: 1. *Italic = emission factor (tons/acre/year);* Roman = emissions (tons/year).
2. For methodology, see Appendix I.

Source: Arthur D. Little, Inc., estimates and calculations.

## TABLE III-4

## CONSTRUCTION EMISSIONS

| Range Improvement | Total Disturbed Acres | Estimated Construction Time/Unit (days) | Acre-days of Construction | Fugitive Dust Emissions (tons) |
|---|---|---|---|---|
| Wells with Windmills - Vertical | 5.0 | 2 | 10.0 | 0.52 |
| Wells with Windmills - Horizontal | 3.0 | 2 | 6.0 | 0.31 |
| Spring Developments | 5.25 | 7 | 36.75 | 1.91 |
| Storage Tanks | 17.4 | 2 | 34.8 | 1.81 |
| Pipeline | 92.0 | 2 | 184.0 | 9.57 |
| Earth Reservoirs | 18.0 | 10 | 180.0 | 9.36 |
| Catchments | 13.0 | 10 | 130.0 | 6.76 |
| Fences | 150.0 | 1 | 150.0 | 7.80 |
| Cattleguards | 1.4* | 2 | 2.8 | 0.15 |
| Corrals | 0.75 | 5 | 3.8 | 0.20 |
| Total | 305.8 | | 738.15 | 38.39 |

*Assuming 14 units @ 0.1 acre roadway disturbed per unit.

Sources: Chapter I, Table I-10, and Arthur D. Little, Inc., estimates.

quantities involved are huge, simply because of the vast area included within the boundaries of the 26 allotments. This quantity of particulate material is directly responsible for the observed levels of average annual suspended particulates. Dust storms and acute episodes of high wind lead to the particularly high daily averages that are the principal source of ambient air quality standard violation.

A hypothetical ungrazed range (under present conditions)provides a baseline against which to compare the effects of both existing and proposed grazing levels. The difference between emissions estimates for the existing, the ungrazed, and proposed conditions is significant and leads to the observation that grazing impacts on vegetation have a significant impact on the air quality of the region.

(2) Range Improvements and Water Developments. In general, air contaminants from construction activities comprise fugitive dust from ground disturbance, particulate matter from materials handling and fuel combustion, and gaseous pollutants from heavy machinery operation or from surface coating. For the proposed action, fugitive dust from ground disturbance of 2929 acres is by far the most significant. The amount of fuel consumed by heavy equipment or the dust released from cement handling is insignificant when spread over the four years and 310 acres of actual construction.

The standard method for estimating fugitive dust from construction is set forth by the EPA. The method is derived from studies of construction sites near Las Vegas, Nevada, and Phoenix, Arizona, and hence is readily adaptable to the project under study. The emissions factor used to estimate fugitive dust from construction is 0.052 tons/acre/working day, reflecting active construction (including some inactivity, some earth-moving, and some heavy equipment activity) in arid areas.

Data for the area affected are drawn from Tables III-3 and III-4. An assumption of the length of time that disturbance would be concentrated at any point was added to the area data, yielding an estimate of the number of acre-days of project construction as shown in Table III-4. The total emission estimate is 38.4 tons. When spread over approximately four years of construction, however, the average emissions rate is only 9.6 tons per year, which is small by comparison with existing point sources.

(3) Vegetative Manipulation

- Chaining

The proposed action is to remove 705 acres of pinyon-juniper vegetation by chaining as described in Chapter I. The chaining is proposed only for the Truxton Canyon allotment and will take place in the fourth year of the program.

According to the methodology for determining emissions from chaining as described in Appendix A and the location in the Truxton Canyon allotment, which is partially in foothill and partially in mountain terrain, a precipitation/evaporation index value of 25 was used to calculate project emissions. Total emissions are projected to be 63 tons which may be spread over a period of several days.

- Burning

It is proposed in the AMPs to burn 1920 acres of blackbrush scrub in order to provide for replacement by species better suited as forage, as described in Chapter I. All burning is to be confined to the Mt. Tipton allotment and will occur in the third year of the program. Depending on the moisture content of the fuel and on the wind, the burning may take several days.

Table III-5 presents the emissions for various categories of pollutants. The quantity of pollutants is quite high considering the modest amount of fuel consumed -- primarily because of the poor combustion environment in a wildfire. Burning moist fuel from the downwind side as in a controlled burn will only aggravate the poor combustion efficiency and will result in maximum possible pollutant emissions.

TABLE III-5

BLACKBRUSH BURNING EMISSIONS

| Pollutant | $P_i$ (kg/MT) | Emissions (MT) |
|---|---|---|
| Particulates | 8.5 | 6,528 |
| Carbon Monoxide | 70.0 | 53,760 |
| Hydrocarbons | 12.0 | 9.216 |
| Nitrogen Oxides | 2.0 | 1.536 |
| Sulfur Oxides | Negligible | Negligible |

Sources: U.S. Environmental Protection Agency (1975), AP-42, Supplement 4, Section 11-1; Arthur D. Little, Inc., estimates.

(4) Vehicles. It is expected that vehicular traffic on the study area's unpaved roads will not significantly increase or decrease due to the proposed action or as part of any existing trend.

(5) Point Sources. Point source activity such as mining and power generation is assumed to continue at present levels, roughly 140 tons per year. The project entails no enhancement or restriction of mineral extraction in the planning area. At present, there is no estimate available for either new mining or new power generation within an area that would directly affect the Cerbat/Black Mountain district.

2. Geology and Topography

The geological and topographical character of the area is not expected to change in any significant or noticeable manner in either the short or long term. None of the grazing practices nor vegetative manipulation will alter geological or topographical characteristics. Very minimal surface changes will be made to the topography as a result of the construction of some remotely located improvements such as water catchments, reservoirs, and storage tanks. There are only 93 such improvements affecting 52.6 acres over a four-year period, with a maximum size of one acre for a catchment, two acres for a reservoir, and one-fifth of an acre for a storage tank.

Similarly, there will be no effects on paleontology as the two areas of value at Rampart Cave and Muav Caves are remotely located and in an area not suitable for grazing. Therefore, no disturbance is expected as a result of the proposed action.

3. Soils

a. Grazing Systems

(1) Less Wind Erosion/Dust. As discussed in subsection 5 below, the long-term cumulative benefits to be derived from grazing management through AMP implementation are additional plant vigor and growth and an increase in seedling establishment and litter accumulation. There will be, therefore, less ground surface area exposed to wind thus reducing wind erosive conditions (see also subsection 1 above for the reductions in particulates). This effect will vary, however, with the type of soils and locations and with the 13 allotments* in the valley areas experiencing more erosion comparatively than those in the foothills and mountains. The impact will be beneficial and of moderate importance for the entire ES area. This effect will not hold true for the custodial allotments as they are in poor condition and are not proposed for any intensive management.

The moderation of potential livestock use within the ephemeral allotments will have a moderately beneficial impact of reducing sediment loss over time. The combined present sediment loss of the three ephemeral allotments (Silver Creek, Thumb Butte, and Portland Spring) is 46.36 acre-feet per year. Following implementation of the ephemeral grazing system, sediment loss is expected to be reduced to 43.06 Aft/yr, a reduction of slightly more than 7% (Table I-3). The relative reduction in sediment loss for the ephemeral portions of the Big Ranch, Diamond Bar/Gold Basin, and Ft. McEwen allotments will be comparable to the totally ephemeral allotments. A principal factor in potentially reducing sediment loss will be the greater quantity of litter being retained on said ranges. Adherence to the ephemeral grazing system will have long-term beneficial impacts in reducing erosion and sediment loss over an extensive area.

(2) Less Water Erosion Sediment Yield. Sediment load as identified within the ES area is extremely low in general as shown in Table II-4 and Figure II-9.

The sediment yield for the ES area except for the custodial allotments is low, totaling 686.15 Aft/yr. Under the grazing practices of the AMPs, this is expected to drop by 10.65% to 612.15 Aft within 20 years. The yield per allotment is shown in Table I-3.

An increase in ground cover, hence interception of precipitation, from improved long-term grazing management will reduce overland flow and also the erosion hazards as shown in Figure II-8. This will be particularly true for those allotments in the valleys except for the custodial lands. These lands which appear to be in poor condition cannot be expected to improve without intensive management. The impact will be area-wide, beneficial, and long term.

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*Allotment numbers 7A, 10A, 15A, 17A, 19A, 20A, 27A, 29A, 30A, 34A, 42A, 56A, and 71A.

(3) Increased Soil Erosion. As grazing management systems are implemented, periodic concentration of livestock numbers in the "use" pasture and particularly around water sites will cause additional compaction, thereby increasing the opportunity for erosion in these localized areas. This concentration will affect as much as 1200-1600 acres around the proposed 142* water developments. This impact will result in a sediment yield of 0.5 to 0.6 Aft/yr depending on location, as noted above, use, and climatic conditions.

(4) Increased Water Retention. Improved grazing management through AMP implementation will have a long-term beneficial impact within the ES area. This impact will result from the improved range condition having greater plant density and litter accumulation. These factors will serve to utilize more precipitation on-site, thereby increasing water retention.

b. Water Developments

Soil disturbance will increase in two ways as the result of implementing the proposed water developments. Initial minor disturbance will be caused by access to and movement from the development sites. Actual construction of 156 developments will create a definite temporary disturbance through soil movement and compaction. This will affect 159.4 acres over four years. Fourteen developments will be two acres in size, with three on Mud Springs and Crozier Canyon, six on CQT, two on Diamond Bar/ Gold Basin. A sheet and rill erosion on the banks of the reservoirs and dirt tanks will cause the most damage. Eleven catchments, one acre in size, will be built on the following allotments: one each on Black Mountain, Castle Rock, and CQT, two on Mud Springs and Crozier Canyon, and four on Mt. Tipton. The other 131 developments are a quarter of an acre or less and occur on all allotments except Portland Spring, Silver Creek, Music Mountain, and Cedar Canyon, as shown in Table I-10.

There will also be 92 miles of pipeline installed affecting 92 linear acres. This could result in a sediment yield of approximately 0.04 Aft/yr in the first year of construction and decreasing after that. Diamond Bar/ Gold Basin has the greatest amount of pipeline construction in year one (20.5 miles).

The gross impacts will be negative, localized, and of short-term duration.

c. Range Improvements

(1) Increased Water Erosion. The implementation phase of constructing the planned-for range improvements will in effect increase local water erosion opportunity due to soil disturbance of 145 linear acres through ingress, egress, and construction. The impacts of construction are localized, negative, and short term. The largest amount of fencing constructed in any one year is 54.3 miles and is 10 miles or less per allotment. The Black Mountain allotment has the most fencing (32 miles)

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*156 developments, including 95 attached troughs less 14 vertical wells and all pipelines.

to be installed. The sediment yield will be negligible. The opportunity for continued access on trails utilized for entry to construct improvements will have a continuing negative impact on a localized area for the long term.

(2) Increased Soil Disturbance. This is a short-term, localized, negative impact. The primary impact will be the disturbance during the construction phase and will result in emissions as discussed in subsection 1 above. Following initial fabrication, the majority of the disturbed sites will be "covered-up" with the improvement.

d. Vegetative Manipulation

Increased Soil Erosion and Soil Disturbance. The proposed chaining of 705 acres of pinyon-juniper on the Truxton Canyon allotment will have an immediate negative impact on the very localized area through extreme soil disturbance caused by uprooting of the deep-rooted woody species. This soil disturbance will create a local high dust potential problem for a relatively short period of time (see also discussion in subsection 1). Studies in southern Utah have demonstrated no consistent decrease or increase in sediment yields following clearing of pinyon-juniper and seeding to grass.* Only when the slash debris is windrowed following chaining is there the potential for increased runoff and sediment yields.** The potential sediment yield for this area will be 0.36 Aft/yr until seedling establishment takes hold in approximately two to three years under normal circumstances.

A comparable impact can be anticipated from the burning of 1920 acres of blackbrush in the Mt. Tipton allotment. The potential for increased sediment yield from the burn site is expected to be slight to moderate immediately following the burn with long-term sediment loss being reduced. Increased surface-water flow could be expected to increase over the short term due to the blackbrush canopy removal over soils with a moderately high to high runoff potential. The sediment yield is estimated to be 0.93 Aft/yr.

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*Gerald F. Gifford, "Runoff and Sediment Yields from Runoff Plots on Chained Pinyon-Juniper Sites in Utah," Journal of Range Management 26:440-443, 1973.

**Gerald F. Gifford et al, "Infiltration and Erosion Studies on Pinyon-Juniper Conversion Sites in Southern Utah," Journal of Range Management 23:402-406, 1970.

## 4. Water Resources*

### a. Groundwater Sources

Grazing Systems. The relatively small increase in the use of groundwater will not create measurable effects in the aquifer systems in the valleys of the ES area. Minor changes involving water levels and water quality can be anticipated in the mountainous areas but these effects will be highly localized.

The increased use of groundwater results from the drilling of 14 strategically placed vertical wells, 27 horizontal wells, and the development of water from an additional 22 springs and seeps in the upland areas. The two wells and 28 spring developments existing on the custodial and ephemeral allotments will affect the groundwater to a lesser extent as no improvements are proposed.

- Valley Areas

Potential well yields[1] from the valley area aquifers range from 10 gallons to more than 2500 gallons per minute. Because such yields exceed demands at individual stock wells, it is reasonable to assume that the aquifers can be developed readily for additional stock water. In many locations in the Hualapai, Sacramento, and Detrital basins, the transmissivities of the aquifers are sufficiently large that stock water withdrawals will produce only negligible drawdowns in the immediate vicinity of the wells. It is certain that no regional water level declines will develop from the total anticipated stock watering demand. This withdrawal will occur on 13 of the 26 allotments, involving nine new vertical wells and repair to seven existing wells.

- Mountainous and Upland Areas

The estimates made by Gillespie and Bentley[2] that approximately 50% of the spring discharge in upland areas is currently utilized for stock watering purposes indicate that most of the accessible springs have already been developed. Additional stock watering demands in these upland areas will result in the development of 22 springs and the five new vertical and 27 horizontal wells.

Because the transmissivities of the upland aquifers are generally small and because the aquifers have limited areal extent, water level declines can be anticipated as a result of well withdrawals, even in the 2-10 gallon-per-minute production range. Such withdrawals will have little effect on a regional scale because the aquifers supplying the wells are generally of unlimited extent; however, the yields of nearby natural seeps and springs could be diminished, thus causing adjustments in wildlife feeding habits and reduced natural vegetation in very local areas.

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*References for this subsection follow on page III-89.

• Groundwater Recharge Areas

Recharge to the aquifers in the valley is not expected to be altered appreciably as a result of the proposed action. Small changes in the small existing natural recharge rates are likely to go undetected in terms of basin-wide water levels.

b. Surface Water

(1) Grazing Systems

• Decreased Runoff

The long-term benefits of intensive grazing management should benefit the condition, and hence herbage production of the range, as discussed in subsection 5 below. This improved vegetative condition will decrease the runoff potential of the ranges within the ES area. This impact will be long term, yet minor. However, runoff in the custodial allotments and lands will increase. The ephemeral allotments will most likely remain the same under the range rule but at what rate is not known.

The total annual water yield in the Hualapai and Sacramento valleys is approximately 4000 Aft (Moore's method for estimating mean annual runoff). No estimate has been made of annual runoff in the Detrital Valley.

The nature of precipitation in the area -- that is, relatively low annual precipitation with nearly all areas experiencing short periods of intense rainfall during a storm period -- is such that grazing systems themselves will have a small impact on reducing surface water runoff.

• Increased Water Retention

A benefit of improved range condition occurring as a result of long-term grazing management is the retention of precipitation. As plant density increases, particularly in grassland types, more of the available moisture is utilized by the plants on-site and less runs off.

• Water Quality

Water quality in the valley area is good. The depth to water is more than 100 feet in most of the lowland areas, a depth that will retard the downward movement of potential stock-induced pollutants such as sodium chloride from feeding stations and manure, or nitrates resulting from the chemical breakdown of manure. In areas of intensive grazing around shallow wells, negligible to small increases in chlorides or nitrate can be anticipated over a few tens of years, but these increases will be small due to the dilution effect of the large volume of water in storage in the aquifers.

The water quality in the upland aquifers is expected to be more sensitive to grazing than in the valley aquifers. This is primarily because the upland aquifers contain smaller total amounts of water and, in the alluvial deposits in canyons, the depth to water is generally less than in the valley aquifers. Sodium chloride and nitrate concentrations will increase as a result of leaching of these constituents downward from the surface into the groundwater systems in the vicinity of springs and wells where there is intense grazing. It is doubtful that this type of contamination will be detected until a long period of time has elapsed, and only small volumes of groundwater will be affected. No negative regional water quality problems will result.

(2) Water Developments. There are 68 water storage tanks proposed within the ES area varying in capacity from 1000-75,000 gallons. The total water storage capacity projected for enclosed tanks at any given time would be approximately 1 million gallons or 3 Aft.

Water sources for the enclosed storage tanks would be wells (vertical and horizontal), springs, and artificial water catchments. Additional water storage is anticipated for nine earthen reservoirs or dirt tanks.

Each dirt tank would probably store from 3-5 Aft on a seasonal basis. Hence, potential capacity of the nine proposed dirt tanks would be 27-45 Aft. The quantities of water stored within the ES area would be a beneficial impact of moderate significance.

Another beneficial impact resulting from earthen reservoir construction would be the reduction in overland flow of sediment to drainages, as the sediment traps above the reservoirs would limit downslope movement of sediment.

(3) Vegetation Manipulation. The negative impacts of lowering the quality of the surface water originating from the areas designated for vegetation manipulation (705 acres of pinyon-juniper chaining and 1920 acres of blackbrush burning) are localized, short term, and relatively insignificant.

Following pinyon-juniper conversion, the possibilities for increasing overland flow of water is not promising. Although clearing of Utah juniper may increase the moisture available for forage production, it may have little effect upon runoff.[3] Giving due consideration to the documented hydrologic results from the southwestern pinyon-juniper type, the possibility of increasing water yield through tree overstorm removal does not appear promising.[4]

5. Vegetation*

a. General Description and Phenology

The shrub-grass scrub disclimax communities that now exist in the Hualapai Valley, particularly on the Cedar Canyon, Cane Springs, and Canyon Ranch allotments, are a result of the historical use and management pattern that has occurred in the area since the introduction of domestic livestock. Continuance of grazing without the proposed action in the Hualapai Valley could further impair this disclimax community.

This disturbance community results from grazing pressure and competition between the grasses and shrubs. Grasses are better adapted to grazing pressure than other plant growth-forms. Growth originates at the basal meristem, close to the soil surface. Aerial portions are less necessary to the plants' survival and may be regenerated quickly (1) if the root-crown is not permanently damaged, and (2) if sufficient photosynthesis has taken place to provide for root development and annual replacement.[1] In fact, moderate grazing during the winter may stimulate plant growth the following spring, because removal of plant material containing carbohydrate reserves may increase photosynthetic activity to replace the lost material.[2] Enough plants must be allowed to bloom and seed to replenish the seedbed resources.

If one or more of the above factors are significantly impaired by continued trampling, foraging, and soil disturbance, grass populations will diminish in vigor, species diversity, and density. The suffrutescent (aerial portions toward the root-base slightly woody) shrubs and cacti which are frequently present, such as goldenweeds, snakeweeds, white burrobrush, prickly pear, and the disturbance species such as Russian thistle and filaree, are then able to take over dominance and the disclimax communities result.

Variations of rest rotation grazing systems such as the Santa Rita system are designed with plant phenology and seasonal growth habits in mind. For example, in the Santa Rita system, the rest period of March through October two years out of three is designed to be physiologically beneficial to cool season species which generally initiate growth in March, as well as to warm season growers that usually initiate growth in July. The rest phase still continues through October, which favors complete phenological development of both the cool and warm season species before grazing use. (See Table II-8.)

The potential favorable impact on the vegetation through physiological rest can only be as significant as the soil potential and moisture regime of the area will allow. Exclusive of the plant rest opportunity, the soils on Big Ranch, Black Mountain, Ft. McEwen, and Castle Rock have very low potential for range forage production on a sustained basis. (See Table II-11.)

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*References for this subsection follow on page III-90.

The three- and four-pasture rest rotation grazing systems have been designed with the phenology of the plant as the guideline for time of grazing. These systems have been successful in areas somewhat similar to the ES area, though not yet proven within this area.[3] They are designed to match the phenological stages of key plant development in deference to favoring species by season of growth. Hence, it is critical to initiate the season in sequence with the phenological development of the key species so as to achieve the management goals (see Chapter I).

b. Vegetative Condition of the Range

(1) Santa Rita Grazing System. With the imposition of this grazing system on Big Ranch, Black Mountain, Cane Springs, CQT, Dolan Springs, Ft. McEwen, Mineral Park, Mt. Tipton, Pine Springs, Stockton Hill, and Castle Rock allotments, range conditions should improve over the long term. This is premised upon an expected improvement in plant density and vigor, hence potential production, as has been indicated in studies conducted on the Santa Rita Range Experiment Station south of Tucson.[4] Though these studies were conducted within the Sonoran Desert Biome rather than the Mohave Desert Biome, it is anticipated that the general principles of the system will be applicable within the ES area. Only after long-term imposition of the system will its merits be evaluated. This system, which allows for 67% of the total range to be resting two years out of three, should improve plant vigor, herbage production, and slowly over time, change the species composition to one of more desirable species.

Of seven allotments to receive the Santa Rita system, the percent of soil associations composing each that have medium potential to produce additional forage under management is as follows:

| | |
|---|---|
| Cane Springs | - 36% |
| CQT | - 45% |
| Dolan Springs | - 10% |
| Mineral Park | - 50% |
| Mt. Tipton | - 66% |
| Pine Springs | - 23% |
| Stockton Hill | - 100% |

The opportunity for these allotments, or portions thereof, to respond appreciably to the system of grazing is reasonably good and is directly related to the present condition of the range where it is to be be implemented.

The soils of Big Ranch, Black Mountain, Ft. McEwen, and Castle Rock have very low potential for forage production. The initial imposition of the system on those allotments in poor to fair condition will require considerable flexibility in order to get the system initiated even by stocking at 90% of estimated grazing capacity. It necessitates concentrating all livestock in a single pasture, and denying use of 67% of the allotment to livestock two years out of three.

The potential increase in carrying capacity of the 11 allotments going on the Santa Rita system is 24.7% (going from initial stocking of 1653 cyl to 2061 cyl). (See Table I-3.)

The initial impact will be negative for an extended period of time. The long-term impacts upon forage production and plant vigor should be beneficial. Because of the relative potential of the large acreages of some of the allotments made up of soils with poor potential, the impact will be only moderately significant.

(2) Rest Rotation Grazing Systems (three- and four-pasture). Three-pasture rest rotation will be implemented on the Canyon Ranch and Diamond Bar/Gold Basin allotments and four-pasture rest rotation on the Upper Music Mountain allotment. The significant difference between the three- and four-pasture systems is the amount of time that pastures are denied to livestock use. The three-pasture system provides for 56% of the total area to be rested at any time, while 44% of the area is grazed. This implies 20 months of pasture rest out of each 36-month period. The four-pasture system provides for 16 months' rest per pasture out of each 48-month period. Hence 67% of the total area is being grazed. In the four-pasture system there is an opportunity to move some livestock to another pasture during some winter months, providing use in that pasture has been below the 60% utilization standard.

Five percent of the soils comprising Canyon Ranch have a medium potential for improvement while for the remainder the potential is very low. Thirty eight percent of Diamond Bar/Gold Basin soils have a medium potential for improvement, a total of 93,868 acres. The Upper Music allotment's soils that have a medium potential for improvement comprise 93% of that allotment, or 43,481 acres (see Table II-11).

Grazing capacities are anticipated to go from the initial stocking level of 1195 cyl to 1604 cyl, an increase of 34.2% over time.

The impacts of the imposition of these rest rotation systems should be to enhance the vigor and ultimately the forage production of the desirable species over time. The initial implementation phase of the systems must be flexible so as to minimize the impact of the initial stocking rates on the Upper Music and Diamond Bar/Gold Basin allotments which both reflect fair to poor conditions. Even with the constraints of stocking to 90% of estimated grazing capacity and using 60% utilization as the moderator in the use pasture, the need for flexibility at the front end is critical.

Because of the concentration of all livestock within the designated use pasture with the implementation of the system, the short-term impacts upon ranges in relatively poor condition will be negative, local (specific to the three allotments), and significant. Over time, the impacts can be positive relative to improved plant vigor, increased crown cover, increase in numbers of desirable species, and complementary forage production.

(3) Deferred Grazing Systems. Deferred grazing systems are scheduled for Curtain, Cedar Canyon, Clay Springs, Hackberry, Gediondia, Mud Springs, and Truxton Canyon allotments. Music Mountain and Crozier Canyon, already under such a general system, will continue with remedial changes planned for the future.

This system offers the fewest adjustment problems relative to management changes for the livestock operator. So in this respect, the impact is minimal on the operator.

As deferred grazing systems are allotment-specific, each will be imposed based upon the present condition and potential for that allotment to respond. Experience to date on the two allotments (Music Mountain and Crozier Canyon), where forms of deferred grazing have been instituted for some years, would indicate the specific need for continual reassessment as the plans are implemented. Range improvements must be properly sequenced to the rotation schedules, and the stocking rate must be consistent with available forage as a prerequisite to instituting the grazing system.

Judicious application of allotment-specific deferred grazing systems will enhance present range condition, thus improving plant vigor by periodically deferring livestock use during critical seasonal growth periods. Though lacking the long-term rest periods inherent in rest systems, the seasonal deferment aspect (often covering both spring and summer seasons) will improve forage production and will periodically allow for seed production and seedling establishment.[5]

Effective institution of variations of this system will initially require concentration of livestock in the use pasture. To ease the impact, judicious culling programs should be instituted so that initial numbers are minimal. The initial pasture should be the "best" pasture so as to minimize impact. Any culling reduction is temporary in nature to minimize the first grazing sequence.

Those allotments with soil associations that have a minimal opportunity for improvement under deferred grazing include Curtain, Gediondia, and Mud Springs. The inherent potential of a major portion of the soils comprising Clay Springs, Truxton Canyon, Music Mountain, and Crozier Canyon allotments for response to deferred grazing is good. Hackberry and Cedar Canyon have substantial areas of soil associations that have opportunity for response, though they do not comprise more than a quarter of each allotment.

Grazing capacities are expected to increase from 2272 cyl to 2489 cyl (initial stocking to potential) with imposition of the proposed action. This is a moderate increase of 9% and is somewhat in line with treatment goals of maintenance and improvement of the allotments as indicated in Chapter I.

The beneficial impacts are in improved plant vigor, improved forage quality, more uniform grazing, improved seed production, and seedling establishment. These impacts will increase forage production in relation to the inherent potential of the soils to respond to treatment.

The negative impacts include additional time input in seasonally moving livestock and the need to ensure establishment of all proposed improvements prior to the initiation of the system.

(4) Under all Grazing Systems. With the implementation of the AMPs, all allotments under formalized grazing systems should respond favorably over a period of time. The average percent crown cover should increase, since any grazing system that is designed with periodic rest and deferment favoring the plants based upon phenological and seasonal considerations should be beneficial. Over time, such management changes may significantly change the percent crown cover. Such changes can result in increases and decreases in crown cover (vegetation overstory). Decreases in total crown cover can result in increases in forage production. A comparison of crown cover of grass subtypes versus shrub and tree cover indicates that the lower crown cover for grasses will yield significantly more forage production (Table II-12).

c. Threatened and Endangered Plant Speices

The range and habitat studies which will be implemented to evaluate and adjust the AMPs should result theoretically in greater knowledge of and protection for the threatened and endangered (T&E) plant species of the ES area. However, insufficient knowledge of the distribution of ES area species and species known to occur nearby, difficulty in the recognition and identification of T&Es, and the lack of data concerning the habitat requirements and phenology of the plants will make this task extremely difficult.

(1) Grazing Systems. All of the T&Es have life-forms which are susceptible to grazing pressure as discussed in Chapter II-B5. *Agave mckelveyana* and *Encelia farinosa* var. *phenicodonta* are probably eaten by cattle and wildlife; *Astragalus lentiginosurs* var. *ambiguus* and *Opuntia basilaria* var. *treleasei* are eaten by wildlife. The palatability is unknown for the remainder of the T&Es.

The plants do not have to be eaten by livestock to be injured by grazing; destruction of the habitat is considered sufficient to threaten the plants. Trampling can damage roots, limit seedling establishment (most of the T&Es reproduce by seeds), and hinder water infiltration. Erosion of the substrate can expose roots and carry away needed soil and minerals. *Astragalus lentiginosus* var. *ambiguus*, *Opuntia basilaris* var. *treleasei*, and *Penstemon bicolor* subsp. *roseus* could be damaged by this. Grazing of shrubs can destroy protection and shade (*Agave mckelveyana* would be especially susceptible to this type of habitat damage.)

- Rest Rotation

Compared to the present yearlong grazing, the proposed rest rotation systems will provide the opportunity for the vigor of the T&E plants to improve.

• Deferred

Seven of the nine T&E species occur, or have the potential to occur, on the nine allotments which will have deferred grazing systems. Since the phenology and physiological requirements of the T&E plants are little known and grazing will occur during the growing season, there could continue to be impacts on these species in allotments under the deferred systems.

• Ephemeral

Seven of the nine (all except Fraxinus cuspidata var. macropetala and Sophora arizonica) T&Es grow in the ephemeral portions of the range. In addition, there is a very good likelihood that the T&Es could be located over much more of the ephemeral range than the current known locations. Since these areas are unsurveyed and there is little change in the proposed action over the current grazing practice on the ephemeral range, T&Es will probably not benefit and may even suffer in the long term with continued grazing of the ephemeral ranges. Even though the cattle will supposedly be grazing the annual crop (and that to the 50% level), the animals will eat all palatable plants and can damage the remainder as noted above.

• Custodial

Two threatened and endangered species have the potential to occur in custodial allotments: Sophora arizonica in Valentine and Cook Canyon; Opuntia basilaris var. treleasei in Feldspar and Jones Spring. These allotments are inspected periodically to assure that over-utilization does not occur, but livestock numbers or seasons of grazing are not controlled by the BLM. Since the regulation of grazing is left up to each individual rancher, the effect on the T&Es (if present) is uncertain.

(2) Range Improvements. The endangered plant species clearance undertaken before construction of any improvements (see Chapter I) should prevent destruction of those species in the potential rights-of-way. Survey of the ES area has not been sufficiently comprehensive to expect that all allotments have their T&Es adequately recorded. It has also not been sufficient to demonstrate the presence or absence of T&Es in the vicinity of the proposed improvements. Fraxinus cuspidata var. macropetala and Crossosoma parviflora are the only presently known T&Es which could be affected by spring development.

Construction of pipelines, fences, troughs, storage tanks, catchments, and reservoirs will eliminate vegetation on the construction sites or cause localized short-term decreases in ground cover and vigor of the plants and could result in grazing in areas not presently grazed.

(3) Vegetative Manipulation. The controlled burning and reseeding of the blackbrush area on the Mt. Tipton allotment will involve 1920 acres. Astragalus lentiginosus var. ambiguus and possibly Penstemon bicolor subsp. roseus could occur in this area. Sophora arizonica and Crossosoma parviflora should be looked for before chaining of 705 acres of pinyon-juniper on the Truxton Canyon allotment.

d. Poisonous Plants

The general assumption that an improved range will reduce the number of poisonous plants is not always a valid one. Because of the diverse nature of toxic plants, some will be reduced in number while others may increase in localized areas.

A beneficial impact of an improved range condition is that though the number of toxic plants may go up or down, dependent upon the grazing cycle and location, the opportunity for animal selection of poisonous plants may be reduced because of a greater abundance of the forage species from which to select.

Under all grazing management systems (Santa Rita, rest rotation, and deferred) the poison plant problem will potentially moderate once pasture and seasonal rotational patterns are established.

A definitive impact assessment of the poisonous plants cannot be made at this time as the density and distribution of these plants is not known.

e. Ephemeral Ranges

With the imposition of the proposed ephemeral grazing system in the Silver Creek, Thumb Butte, and Portland Spring allotments, and on extensive portions of the Big Ranch, Diamond Bar/Gold Basin, and Ft. McEwen allotments, there will be no significant change in the current grazing use pattern of such rangelands. Forage production potential per se will not change appreciably due to the inherent variable nature of the total environment.

Because permitted livestock use on such allotments will be approved by a BLM range conservationist on the basis of 50% of the anticipated forage production for that season, it can be anticipated that there will be a slight increase in the amount of plant litter left on the ground and that a reliable annual seed source would be assured. Under this proposal, it is doubtful that seasonally permitted livestock numbers would ever be in excess of past licensed use. Hence, the impact upon the ephemeral vegetative community would be positive over an extensive area and would be of a long-term nature.

f. Custodial Management

Implementation of the AMPs within the ES area will not affect management per se on the eight custodially designated allotments. They will continue to receive "caretaker" management. This type of management can only be a continuing deterrent to attempts to improve these particular grazing resources. On the basis of continuing the status quo management on these allotments, the long-term and short-term impacts upon the grazing resource that encompasses 180,585 acres will be negative, localized (to the specific custodial allotments), and significant.

Additionally, the grazing impact upon those allotments with portions of designated custodial range will be administered in line with custodial designation. The custodial portions of these allotments total 207,538 acres, plus an additional 18,207 ephemeral acres in this category -- for a grand total of 225,745 acres (Table I-2). This is a significant portion of the ES area, in fact approximately 11% of all of the acreage under all phases of management. As one of these allotments, Thumb Butte, is ephemeral, there will be no management save under the Ephemeral Range Special Rule. Cedar Canyon and Cane Springs should not be negatively impacted as livestock numbers are controlled. Likewise, Ft. McEwen, though livestock numbers are controlled, has the opportunity to manage its custodial portion as it is fenced off from the management unit. On the three allotments where livestock numbers are not controlled -- Castle Rock, Canyon Ranch, and Ft. McEwen -- and/or the allotments that at present do not have fencing separating the custodial from the management portions (Black Mountain, Castle Rock, and Canyon Ranch), the short-term and long-term impacts of continued custodial use will be negative, localized, and significant. The preponderance of the latter three allotments would at present be listed, in terms of range condition, as fair to poor. Continual custodial management will not improve these conditions.

g. Vegetative Manipulation

(1) Pinyon-Juniper Clearing. The vegetative manipulation by chaining and seeding to convert 705 acres of pinyon-juniper in the Truxton Canyon allotment to scrub grassland will have a localized, long-term adverse impact on the pinyon-juniper removed. However, with the establishment of the seeded species, there will be an increase in forage production, hence grazing capacity. Conversion of Utah juniper (*Juniperus osteosperma*) on the Beaver Creek Watershed south of Flagstaff to a grassland aspect has resulted in an increase of about 0.21 to 0.32 AUMs per acre for the more successful efforts.[6] With comparable success, this could indicate an increase in grazing capacity of from 148 to 225 AUMs for the 705 acres to be converted in the Truxton Canyon allotment. This action will have a long-term beneficial impact upon vegetation forage quantity and quality for the localized area.

Additional support that would indicate the success potential for pinyon-juniper modification and seeding in this area has been the observation of a 1963 chained and seeded site in Pasture 2 of the Upper Music allotment which lies 35 miles north of the Truxton Canyon allotment in the same vegetation type. Though there are no records documenting increased AUMs as a result of this effort, herbage production data collected in October 1977 (see Table II-10) following three years of non-use, indicates a measurable increase over adjacent pastures and allotments having untreated pinyon-juniper stands. Twenty-one 96-foot long, 1-foot wide belt transects run within the 1963 chained and seeded site produced an average of 262 pounds per acre of air dry forage. Converted to AUMs per acre, this is 0.148 (see Appendix E). This compares with an average of

90 pounds per acre of air dry forage on untreated pinyon-juniper sites on other allotments within the same area. This production equates to 0.05 AUMs per acre. (It should be noted that the 1977 data collection period followed a very dry season; hence forage production would be measurably higher in a good year.)

The potential for successful seedling establishment under the proposed chaining and seeding program scheduled for Truxton Canyon allotment is remote. The deferred grazing system under which this allotment will be managed does not allot sufficient non-use time in the grazing schedule (at least two growing seasons of protection) to allow for the opportunity for seedling establishment. Hence, the impacts of this action as planned will be negative unless there are sufficient remnant grasses present that could respond in time to the "release" from the removal of the competitive woody species.

(2) Blackbrush Burning and Reseeding. The impacts of burning and seeding on the Mt. Tipton allotment would appear to be somewhat inconclusive in the long term, though the short-term, localized impacts would tend to be beneficial from a forage production standpoint.

On the shallower soils (Rock Outcrop sites), blackbrush is a shallow-rooted shrub found in essentially pure stands, devoid of perennial grasses and with few other shrubs. The implication is that on such shallow soil sites, blackbrush stands for climax. In a 1976 study within the blackbrush type in northwestern Arizona,[7] greater amounts of grasses occurring within the blackbrush type were associated with the deeper soils.

Burning has proven to be an effective means of converting blackbrush to other vegetation. Three burns of the blackbrush type within a few miles of each other in southwestern Utah (near Beaver Dam Wash) approximately 29 years ago yielded dramatically different results:

- Burn A - Blackbrush was replaced with a variety of annual grasses and forbs, and desert shrubs including desert bitterbrush, desert almond, yerba santa, big sagebrush, and turpentine broom.

- Burn B - Blackbrush was replaced with a pure stand of snakeweed, a plant of lesser forage value containing toxic principles.

- Burn C - Blackbrush on this upland bench was replaced with big sagebrush.

Two blackbrush burned sites that were seeded approximately seven years ago have resulted in excellent stands of introduced wheatgrasses. However, they are now showing considerable invasion of the nonpalatable yerba santa. These observations indicate that fire effectively destroys blackbrush, and that succeeding plant communities are highly variable.[8]

In northwestern Arizona, Thatcher, Doughty, and Richmond found that natural fires in areas dominated by blackbrush reverted back to blackbrush without the intermediate plant successional stage found in Utah. Also, Humphery[9] states that burning of a blackbrush-buckwheat community kills most of the shrubs, leaving little but bare ground which may eventually support a stand of annual weeds or grasses.

These diverse results point to considerable differences in site potential within the blackbrush vegetative type. The results of blackbrush burning and seeding would indicate that the burning technique is proven for effective control, and that the successful establishment of perennial grasses, forbs, and shrubs will be dependent upon soil and the proper timing of precipitation following seeding.

Because blackbrush is utilized by deer particularly during the winter months, the local, short-term impact of blackbrush burning could be negative. However, with seeding of palatable grasses, forbs, and shrubs following the burn, and its successful establishment, the area could become better year-round range for deer and other wildlife; hence, the long-term impacts could be beneficial for wildlife for the local area.

h. Alteration of Riparian/Spring Site Vegetation

A total of 22 springs will be developed (14 on public land, 8 on private land), resulting in a disturbance to 5.5 acres. Fencing to protect the immediate spring box site from large mammals and the establishment of troughs for cattle and wildlife should be an improvement over present spring site usage. However, the development will permit grazing in areas now unsuitable due to lack of water and will result in concentrated use areas around the troughs.

Some spring/riparian sites in the ES area are of considerable size, and lack of data on the specific sites to be developed makes it impossible to assess how much vegetation would remain outside the fenced area. Vegetation outside of the fenced areas of the spring sites will be subjected to livestock grazing influences such as browsing, girdling, and trampling.

The clearing of the springs and installation of a spring box would have an initial negative impact on those species which normally fill many of the springs: stonewort, pondweed, watercress, algae, and other aquatic plants. However, the intent of the proposed action is that sufficient free water will remain as the source for existing riparian and meadow vegetation.

A total of nine earthen reservoirs will be constructed (six on public land, three on private land), resulting in an initial disturbance to 18 acres. Through time, emergent vegetation (e.g., sedges, cattails, rushes, seep willow, desert willow, tamarisk, etc.) will become established on the edges of the tank.

Since the total land area involved in both spring site and reservoir development is small in comparison to the total ES area, and impacts of both a negative and positive nature are likely, the total impact of water development on the vegetation can be considered to be localized, long term, and of major importance.

## 6. Animals*

### a. Native Ungulates

(1) Grazing Systems

- Santa Rita, Rest Rotation, Deferred

- Improved Habitat. The implementation of rest rotation grazing systems in conjunction with proper stocking levels will have a long-term beneficial impact upon mule deer, desert bighorn, and pronghorn populations throughout the ES area. The increased production of grasses and forbs during spring and summer months is expected to provide young fawns and lambs with greater quantities of essential forage resources. This would reduce the percentages of ES area mule deer, bighorn, and pronghorn offspring mortality which normally results from weakness, disease, and, indirectly, predation. Pregnant does and ewes would also benefit from the increased abundance of forbs. Hawkes[1] states that forbs are believed to be necessary for proper lactation in mule deer does. Overall, rest rotation grazing systems would promote greater fawn and lamb survival rates and would therefore ultimately contribute to larger ungulate populations.

The additional production of winter forbs (globe mallow, tidstromia, milk vetch, trailing four-o'clock, etc.) and shrubs (winter fat, bur sage, range ratany, Mormon tea, wild buckwheat, buckbrush, etc.) from rest rotation grazing would enhance the quality of native ungulate habitat by ensuring adequate forage reserves. For instance, conservative grazing practices have been found to increase the relative density of shrubby buckwheat, an important livestock and wildlife forage plant, from less than 10% to 17% within once overgrazed rangeland.[2] Moderate utilization of available grass forage by native ungulates and cattle would stimulate plant growth and promote seed development during the following spring.[3,4] Therefore, native ungulates inhabiting the ES area allotments which have been selected for rest rotation grazing systems would benefit.

- Decreased Competition. The initial concentration of livestock in use pastures of allotments located on native ungulate habitat will result in localized, short-term conflicts between livestock and big game over forage and water, particularly in regions located within a one-mile radius of major wildlife and livestock watering sources. However, potential habitat competition would decrease throughout ES area allotments as vegetative conditions improved through the implementation of rest rotation grazing systems. Approximately 60% of the rangelands within rest rotation allotments would be free of livestock at any given time. This cyclic exclusion of cattle from individual pastures for up to 13 consecutive months would significantly reduce the frequency of interactions between native ungulates and livestock. Furthermore, allotments which are scheduled for rest rotation systems have collectively reserved 5135 AUMs for inhabiting mule deer, pronghorn, and desert bighorn sheep (see Table I-2 for specific forage reserves on individual allotments).

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*References for this subsection follow on page III-91.

Rest rotation grazing practices in conjunction with wildlife forage reserves are expected to aid in increasing mule deer, pronghorn, and desert bighorn populations on applicable allotments by roughly 242, 14, and 75 animals, respectively, within 20 years following implementation of the proposed grazing systems.[5] The overall impact would be a long-term, area-wide reduction in the potential for severe competition between native ungulates and livestock.

- Ephemeral

  - Decreased Competition. Approximately 635,196 acres of ES area Federal rangelands are classified as ephemeral. Allotments containing ephemeral range include Silver Creek, Thumb Butte, Portland Spring, Big Ranch, Diamond Bar/Gold Basin, and Ft. McEwen. Under normal conditions palatable vegetation within these regions is scarce. This is reflected by the low densities of inhabiting native ungulates. At present, roughly 12 sections are required to support a single mule deer on ES area ephemeral range. In addition, one desert bighorn occupying the same habitat requires an estimated seven sections of ephemeral range.[6]

During years of abundant winter rainfall, large quantities of spring annuals are produced. Since all perennial vegetation will be reserved for wildlife and cattle will be allotted only 50% of available annual forage during these highly productive periods, it is anticipated that adequate forage will be reserved for resident bighorns and mule deer. This would be an area-wide, long-term, minor beneficial impact.

- Custodial

  - Impact Uncertain. Custodial managed ranges in the ES area include the Cook Canyon, Jones Spring, Valentine, Walapai Ranch, Feldspar, Long Mountain, Peacock Mountain, and West Peacock allotments. Stocking levels within these allotments are not controlled by the BLM unless severe overgrazing develops. Therefore, the quality of native ungulate habitat depends, to a large extent, upon the range management practices of individual ranchers. The projected impact of custodial management on the quality of mule deer, desert bighorn, and pronghorn habitat within the eight allotments is unknown.

(2) Water Development

- Improved Water Supply

The additional development of 27 horizontal wells, 22 vertical wells, 95 water troughs, 14 earthen reservoirs, 68 water storage tanks, 11 water catchments, and 92 miles of pipeline on 24 of 26 allotments would increase the availability of water for native ungulates and would extend their summer foraging ranges by providing water where none previously existed. This would relieve grazing and browsing pressures exerted by mule deer, desert bighorn, and pronghorn near existing water sources during summer months, when high temperatures combined with the lack of succulent vegetation force ungulates to concentrate near permanent springs and water troughs.

The development of additional waters within arid and semi-arid regions has been demonstrated to increase the carrying capacities of desert herbivores.[7,8]

Improvements in ES area vegetative conditions from the proposed grazing systems, combined with the increased availability of water for regional wildlife and livestock would, therefore, be expected to promote the growth of native ungulate populations. The development of additional water sources within big game habitat would be an area-wide, long-term, beneficial impact for ES area mule deer, desert bighorn, and pronghorn.

- Attraction of Predators

The development of additional water sources for livestock and wildlife may attract mountain lions and/or coyotes to waters where native ungulates concentrate during summer months. The potential for this condition would be particularly high at new water sources located near thick brush or rock outcroppings where predators could be easily concealed. The attraction of predators to new waters may increase regional deer, bighorn, and pronghorn death losses. This is expected to be a minor, localized, long-term impact.

(3) Range Improvement

- Restriction of Movement

The proposed construction of 172 miles of fences along selected regions of the ES area would create additional obstacles to the unrestricted movement of mule deer, bighorn, and pronghorn. Although the fences will be constructed to minimize access problems, the reluctance of large herbivores to pass over, under, or through the strands of wire will constitute access barriers until the animals learn to negotiate them.[9] An increased potential for death and injury through entanglement or severed flesh would occur when ungulates (particularly desert bighorn) attempt to cross fence lines. This would be a localized, long-term, minor impact on large herbivore populations.

(4) Vegetation Manipulation

- Habitat Conversion

Pinyon-juniper chaining of 705 acres on the Truxton Canyon allotment will exert a localized, long-term, beneficial impact upon regional mule deer herds. McCulloch[10] found that although stands of juniper are essential for winter shelter and emergency browse resources, the chaining of some juniper woodland improves deer habitat by increasing the production of desirable forb and half-shrub forage within cleared areas.[11] The anticipated improvement of Truxton Canyon mule deer habitat would also be expected to promote localized increases in mule deer numbers. Cole[12] discovered a 15% increase in deer usage on pinyon-juniper chained areas in Nevada.

A site covering 1920 acres of blackbrush on the Mt. Tipton allotment has been proposed for burning (see Table I-3). Because blackbrush is utilized by deer, particularly during the winter months, the local, short-term impact of blackbrush burning could be negative. However, with seeding of palatable grasses, forbs, and shrubs following the burn, and its successful establishment, the area could become better year-round range for deer and other wildlife; hence, the long-term impacts could be positive for wildlife for the local area.

b. Carnivores

(1) Grazing Systems

- Santa Rita, Rest Rotation, Deferred

- Improved habitat. The implementation of rest rotation grazing systems would have an area-wide, long-term, beneficial impact on ES area mountain lions and bobcats. Improved vegetation height, density, and composition within allotment pastures would promote higher densities of game birds, perching birds, and mule deer. The greater abundance of prey combined with improved vegetative cover would enhance carnivore habitat quality and possibly reduce losses of livestock from predation. The effects of ES area rest rotation grazing on local coyote, gray fox, and kit fox populations are unknown.

- Ephemeral

- Improved Habitat. The additional reserves of annual forbs and grasses on ephemeral ranges during productive years are expected to have long-term beneficial impacts on local bobcat, ringtail, coyote, gray fox, and kit fox populations. Although ephemeral livestock grazing has little influence upon shrub development and therefore rodent populations, increased reserves (50%) of succulent spring forage may promote higher seasonal densities of the following: desert cottontail, perching birds, Gambel's quail, mourning doves, white-winged doves, and insects. These small organisms constitute important prey resources for desert carnivores.

- Custodial

- Impact Uncertain. Due to the great variety of range management techniques practiced by individual ranchers, the impacts of custodial grazing upon local carnivore populations are unknown.

(2) Water Development

- Improved Water Supply

Development of 251 new ES area water sources (water troughs, earthen reservoirs, horizontal and vertical wells, water catchments, etc.) for domestic livestock and wildlife would improve carnivore habitat within 24 of the 26 ES area allotments. The increased availability of water would

enable carnivores to extend their seasonal ranges, particularly during summer months. This condition would tend to disperse the intensity of regional predation over wider areas. Development of additional water sources would be a long-term, area-wide, beneficial impact.

- Attraction of Prey

The construction of new water sources within allotments of the Cerbat/ Black Mountain ES area would enable prey species to become seasonally or permanently established within new regions. This would promote the extension of carnivore habitat and may increase predator carrying capacities in response to the anticipated increases in game bird, amphibian, reptile, perching bird, and native ungulate population densities near the additional water sources. The overall impact would be area-wide, long-term, and beneficial for ES area coyotes, gray fox, kit fox, ringtails, bobcats, and mountain lions.

c. Small Mammals

(1) Grazing Systems

- Santa Rita, Rest Rotation, Deferred

- Habitat Conversion. The implementation of rest rotation grazing systems is expected to promote the regeneration of palatable grasses and forbs and eventually result in decreased densities of shrub species.[13] As a rule, overgrazed ranges support higher densities of ground squirrels, jackrabbits, kangaroo rats, and woodrats, while cottontail rabbits often decrease in numbers.[14] This is due primarily to the increased presence of rodent food sources (agave, cholla fruit, pricklypear fruit, mesquite beans, catclaw beans, and annual weeds) which develop on deteriorated ranges.[15] Therefore, it can be expected that densities of the previously mentioned rodents and jackrabbits will decline while cottontail numbers increase with the improved vegetative vigor of perennial grasses and forbs through implementation of rest rotation grazing in designated ES area allotments. This will be a long-term, areawide negative impact on many ES area rodent populations.

- Ephemeral

- Habitat Improvement. The ephemeral grazing system, designed for sporatic vegetative growth within normally unproductive regions of the ES area, may have little or no influence upon local rodent carrying capacities. Since the occasional livestock utilization of ephemeral range will be designed to harvest only 50% of the anticipated or actual production of annuals, it is doubtful that cattle within ephemeral allotments will promote or retard the growth of principal rodents' forage plants (see Chapter II-B6 for specific rodent food sources).

In contrast, substantial reserves of succulent spring forage during productive years may result in occurrences of higher desert cottontail reproductive success. The increased availability of spring annuals would

provide young cottontails with highly palatable and nutritious forage during their critical development stages. The impact of proposed ephemeral grazing on cottontail populations would be long-term, area-wide, and beneficial.

- Custodial

  - Impact Uncertain. The projected impact of custodial grazing practices upon ES area small mammal populations is unknown.

(2) Water Development

- Improved Water Supply

The development of 251 water sources (listed in Table I-3) would improve habitat for small mammals species which require drinking water: jackrabbits, cottontails, most bat species, and porcupines. The impact of these additional water sources would be long-term, beneficial, and area-wide.

- Habitat Disturbance

The development of rainfall catchments, horizontal and vertical wells, water storage tanks, water troughs, and related improvements would have a minor, negative impact on ES area small mammal habitat. There would be temporary losses of habitat on a total of 25 acres during construction activities and long-term disturbances of 60 acres from completed projects. The most intense habitat disturbance (concentrated grazing and trampling of vegetative ground cover) would occur over an estimated 1200-1600 acres of small mammal habitat, adjacent to the proposed livestock water sources.

(3) Range Improvements

- Habitat Disturbance

Minor small mammal habitat disturbance will result from the proposed construction of 172 miles of fences on 17 ES area allotments. The temporary damage of roughly 21 acres from fence construction, combined with approximately 42 acres of long-term habitat disturbance from livestock trailing adjacent to fences, would have a limited effect on overall small mammal habitat.

(4) Vegetation Manipulation

- Habitat Conversion

Pinyon-juniper clearing and blackbrush burning may temporarily reduce the abundance and diversities of small mammals within the manipulated areas. Species which would be impacted in the proposed chaining of pinyon-juniper woodland within the Truxton Canyon allotment include rock

squirrels, canyon mice, pinyon mice, deer mice, white-throated woodrats, and cliff chipmunks. The conversion of selected Mt. Tipton blackbrush communities into regions producing higher percentages of more palatable forage will affect desert cottontail, Merriam's kangaroo rates, cactus mice, canyon mice, rock pocket mice, and white-throated woodrats.

The immediate impact of manipulated pinyon-juniper and blackbrush communities would be temporarily adverse due to the devastation of small mammal habitat. However, long-term effects of such actions may promote small mammal densities and diversities by increasing the localized availability of palatable fruits, seeds, and insects, particularly within the converted pinyon-juniper woodland. This would be a localized, long-term, beneficial impact on ES area small mammal populations.

d. Wild Horses and Burros

(1) Grazing Systems

- Santa Rita, Rest Rotation, Deferred

- Reduction in AUMS. Burro management objectives, for allotments selected to initiate rest rotation grazing practices, involve reductions of burro forage reserves from over 1800 AUMs to 1320 AUMs (collectively). The Canyon Ranch and Mineral Park allotments' wild horse populations would remain relatively unchanged by the proposed rest rotation systems since present and destined horse numbers and forage reserves are similar (see Table I-3).

The decrease in regional burro numbers would benefit native wildlife and domestic livestock by reducing the detrimental exploitation of desert habitat resources from accelerating Black Mountain burro populations.[16] This action would promote the regeneration of palatable plant species within heavily grazed burro ranges.

Established herds of ES area burros, as a whole, would also benefit. The existing equines would be protected and maintained at population levels which do not exceed regional carrying capacities. This would ensure that ES area burros would be provided with sufficient forage during less productive years. Therefore, burros would be managed with emphasis on smaller, healthy herds rather than allowing them to multiply at rates which would prove detrimental to themselves as well as all native plant and animal life. This would be a long-term, area-wide, beneficial impact.

- Improved Habitat. The concentration of livestock in use pastures located within wild horse and burro ranges could result in short-term, localized occurrences of minor forage conflicts between livestock and these equines. Important burro forage including desert fluff grass, Mormon tea, bush muhly, catclaw, white bur sage, and three-awn would be harvested by livestock. The availability of desert needlegrass, bush muhly, galleta grass, grama grass, and Russian thistle for wild horses of the Cerbat Mountains is also expected to become reduced within use pastures

during the initial implementation of rest rotation livestock grazing. However, as forage abundance and quality improve due to the proposed grazing systems, the potential for such competition would be reduced. Furthermore, forage reservations of 1320 AUMs (objective) for burros and 168 AUMs (objective) for wild horses on rest rotation allotments would further reduce the possibility of habitat competition between equines and livestock. Overall, rest rotation grazing on wild horse and burro forage reserves would be a long-term, area-wide, beneficial impact.

- Ephemeral

  - Improved Habitat. Implementation of ephemeral grazing practices within designated ES area allotments (Silver Creek, Thumb Butte, Portland Spring, and substantial portions of Big Ranch, Diamond Bar/Gold Basin, and Ft. McEwen) would improve local burro habitat. During years of adequate production of annual forage plants, stocking levels of cattle will be based upon 50% of the anticipated production. This will provide burros with additional spring forage reserves during years of abundant rainfall. Ephemeral plants which constitute important ES area burro forage include desert Indian wheat, red brome, and filaree. This would be an area-wide, long-term minor beneficial impact.

No ES area wild horses are known to inhabit ephemeral range.[17]

- Custodial

  - No Impact. According to the URA for the Cerbat Mountain Planning Unit, there are no known wild horses or burros within the eight custodial allotments.

(2) Water Development

- Improved Water Supply

Development of two vertical wells, one horizontal well, and two water storage tanks on the Canyon Ranch, and three vertical wells, one horizontal well, two water storage tanks, and one water trough on the Mineral Park allotment would improve ES area wild horse habitat. During summer months, water is the principal limiting factor for Cerbat Mountains wild horses.[18] Additional water sources would reduce the degree of vegetative damage that now occurs near existing water troughs and springs by enabling horses to become more dispersed during dry seasons.

Additional water developments on the Big Ranch, Black Mountain, Ft. McEwen, Gediondia, and Thumb Butte allotments would improve burro habitat within the Black Mountain range. As with wild horses, new water sources would allow burros to utilize larger areas during grazing activities and reduce the intensity of habitat damage near existing waters, particularly during summer months.

The overall impact of additional water developments, accessible to wild horses and burros, would be long-term, area-wide and beneficial.

(3) Range Improvements

• Limited Habitat Access

The proposed construction of 14 miles of fences within the ES area wild horse range and 60 miles of fence through burro habitat would create additional obstacles to free movement, which is necessary for dispersed foraging activities of wild horses and burros, and may promote inbreeding. Additional fences may also increase equine death losses and/or injuries from entanglement and torn flesh. This would be an area-wide, long-term, minor detrimental impact on wild horse and burro populations.

(4) Wild Horse and Burros. At the present time, the ES area burro population density (1825 burros) is far in excess of the stated management objectives of 145 burros as presented in Chapter I (Table I-3). These high burro densities combined with their high reproductive capacity (10-30% increase per year) seriously jeopardize the success of the proposed action.

Wild horse numbers are presently stable (12 animals). In compliance with PL 92-195, the BLM management objectives allow forage reserves for all 12 wild horses.

e. Birds

(1) Grazing Systems

• Santa Rita, Rest Rotation, Deferred

- Improved Habitat. Increased seed production, which is an expected result of implementation of rest rotation grazing systems would create improved habitat conditions for graniverous birds of the ES area. The additional availability of seeds from black grama, Indian ricegrass, bush muhly, side oats grama, filaree, and spike dropseed would increase bird carrying capacities and promote greater avian reproductive success. This long-term, area-wide, beneficial impact would directly affect a majority of local bird species, including lark sparrows, black-throated sparrows, mourning doves, Gambel's quail, rufous-sided towhees, house finches, brown towhees, evening grosbeaks, and Cassin's finches.

The exclusion of cattle from rest rotation pastures for a maximum of 13 months may improve the reproductive success of ES area ground-nesting birds. The potential for nest damage and/or egg breakage to occur from livestock grazing and trampling would be periodically eliminated. This would be an area-wide, long-term, beneficial impact on all ES area ground-nesting birds, including meadowlarks, poor-wills, and nighthawks.

- Ephemeral

  - Improved Habitat. The 50% reservation of sporatic bursts of ephemeral vegetation for wildlife watershed and seed production would occasionally provide many desert-dwelling ES area birds with an abundance of annual forbs. This succulent vegetation constitutes an essential dietary component of many bird species, including mourning doves, white-winged doves, and Gambel's quail. The impact of ephemeral grazing practices on ES area bird populations would be long-term, area-wide, and beneficial.

- Custodial

  - Impact Uncertain. The effects of custodial management on ES area bird populations is unknown since the individual ranchers are likely to employ a variety of range management practices.

(2) Water Development

- Improved Water Sources

The development of 46 new open water sources plus 95 troughs would improve bird habitat throughout the ES area. All new water developments will provide for bird access (ladders) and will be equipped with modifications to prevent drownings (covers on water storage tanks).

The additional water would enable birds to occupy and utilize previously uninhabited regions. This impact would have area-wide, long-term, beneficial effects on all bird species and would be particularly beneficial to doves and quail.

(3) Range Improvements

- Perches

Windmills, fences, and corrals would provide additional relatively safe nesting areas for all inhabiting bird species. This would be a localized, long-term, beneficial impact.

(4) Vegetation Manipulation

- Habitat Conversion

Pinyon-juniper chaining of 705 acres on the Truxton Canyon allotment would promote greater numbers and increased diversities of grassland and low brushland bird species, including western meadowlark, horned larks, and vesper sparrows. However, this vegetation manipulation would have a detrimental effect upon the diversity of bird species dependent upon pinyon-juniper woodland. Scrub jays, red-shafted flickers, and blue-gray gnatcatchers may disappear within localized regions.* The overall, long-term anticipated impact would be a moderate increase in avian species

*Tree foliage feeding bird species will go elsewhere and be replaced by ground feeding species when the pinyon-juniper overstory is removed.[19]

diversity within chained woodland. This would be due to the gradual conversion of such clearings into communities with higher percentages of grasses, forbs, and palatable shrubs, which will promote an increased production of seeds and fruits, while providing nesting sites for ground and/or shrub-nesting birds.

Proposed burning of blackbrush on the Mt. Tipton allotment may result in a temporary on-site extirpation of a number of small desert birds including black-throated sparrows, sage thrashers, fox sparrows, and song sparrows. However, with successful seeding and establishment of palatable grasses, forbs, and shrubs following the burn, overall productivity of the area would be expected to increase.

f. Raptor-Prey Relationships

- Improved Habitat. The implementation of the proposed rest rotation and ephemeral grazing system in conjunction with proper stocking levels should have a positive impact on ES area raptor populations. The anticipated increase in herbage production would enhance habitat conditions for cottontail rabbits, perching birds, game birds, reptiles, and amphibians throughout all 26 allotments. The resulting increase in small vertebrate populations would promote the reproductive success of many local raptor species. Predatory bird carrying capacities would therefore be expected to increase throughout the Cerbat/Black Mountain region. This long-term, area-wide, beneficial impact would directly affect many ES area raptor species, including pigeon hawks, sparrow hawks, and great horned owls in Woodland Formation; red-tailed hawks and long-eared owls in Scrubland Formation; Harris hawks, prairie falcons, and elf owls in Desertscrub Formation; rough-legged hawks, golden eagles, and ferruginous hawks in Grassland Formation; and swainson's hawks in coniferous forest.

g. Amphibians

(1) Grazing Systems

- Santa Rita, Rest Rotation, Deferred

- Improved Habitat. The gradual improvement of range conditions and litter accumulations, as a result of the proposed rest rotation grazing systems, would aid in retaining soil moisture throughout the ES area. Within isolated regions, this condition may enhance existing amphibian habitat by reducing moisture loss within substrate during annual dry seasons. Overall, the impact of rest rotation grazing on amphibian habitat is expected to be area-wide, long-term, and beneficial.

- Ephemeral

- Improved Habitat. As with the rest rotation systems, reduced stocking rates during productive years on ephemeral ranges may promote increased litter accumulations. This is expected to aid in retaining soil

moisture and, therefore, improve ES area amphibian habitat. The anticipated impact of ephemeral grazing practices on amphibian habitat is area-wide, long-term, and beneficial.

- Custodial

  - Impact Uncertain. The influence of custodial management on the quality of ES area amphibian habitat is unknown.

(2) Water Development

- Improved Habitat

Development of earthen reservoirs and water troughs within ES area allotments will create additional breeding sites for western space-foot toads, red-spotted toads, Great Plains toads, and tiger salamanders. Since the breeding behavior of desert amphibians is often initiated by rainfall,[20] water collected in reservoirs following heavy summer rains will provide optimum nurseries for amphibian offspring. This impact would be localized, long-term, and beneficial.

h. Reptiles

(1) Grazing Systems

- Santa Rita, Rest Rotation, Deferred

  - Improved Habitat. Proposed rest rotation grazing systems for designated ES area allotments would have a long-term, beneficial impact on native snakes and lizards. Intermittent livestock exclusion from all regional pastures would promote increased growth of palatable vegetation. This greater abundance of perennial grasses and forbs would provide reptiles with protective cover and an increase in the abundance of game birds and perching birds, which serve as prey for many species of snakes. Furthermore, lizard species diversity has been found to increase proportionally with increases in perennial plant diversity on North American flatland deserts.[21] Therefore, the gradual improvement of vegetative conditions within ES area rest rotation allotments is expected to promote higher densities and diversities of local reptile species.

- Ephemeral

Implementation of the proposed ephemeral grazing practices on relatively unproductive ES area ranges may exert a long-term, area-wide beneficial impact on local snake inhabitants. During the spring growing season, following a winter of substantial rainfall accumulations, high annual reserves would promote increased densities of Gambel's quail, mourning doves, white-winged doves, perching birds, and young cottontails. These small animals would in turn provide many local snakes with abundant prey resources during productive springs. Reptiles which would be directly affected include sidewinders, Mohave rattlesnakes, whipsnakes, and gopher snakes.

• Custodial

- Impact Uncertain. Information concerning the projected influence of custodial grazing practices on ES area reptile populations is unavailable.

(2) Water Development

• Habitat Destruction

Proposed water development projects, including pipelines, rainwater catchments, and earthen reservoirs would cause localized damage within reptile habitat. The short-term disturbance of 160 acres for water improvement projects, along with a long-term loss of 52 acres,* would exert a limited effect upon ES area reptile populations.

• Improved Habitat

Additional developments of water troughs, earthen reservoirs, water storage tanks, and rainwater catchments for livestock and wildlife would enable many bird species to occupy and utilize previously uninhabited regions within ES area reptile habitats. This condition would provide a long-term, beneficial impact by increasing prey resources for larger predatory reptiles, including gopher snakes, all rattlesnake species, kingsnakes, and Gila monsters.

i. Invertebrates

(1) Grazing Systems

• Santa Rita, Rest Rotation, Deferred

- Population Reductions. The anticipated development of improved perennial grass cover within selected rest rotation allotments should result in decreased habitat quality for some local insect populations. Nerney,[22] working on the San Carlos Apache Indian Reservation in Arizona, found that differences in grasshopper population levels are due primarily to differences in the condition of short-grass rangelands. Preferred habitats of grasshoppers were associated with poor rangelands dominated by low growing weeds. For instance, in a heavily grazed area, about 70% of the herbage was eaten by grasshoppers, while rangelands having good management practices (i.e., rest rotation grazing) lost only 20% of the available forage to grasshoppers. Furthermore, studies of insect densities in Oklahoma revealed that 782,000 insects per acre inhabited overgrazed ranges while less than 187,000 insects per acre occupied moderately grazed rangelands.[23] The overall impact of rest rotation grazing practices on ES area insect populations is expected to be area-wide, long-term, and detrimental.

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*For 93 storage tanks, reservoirs, and catchments.

• Ephemeral

- Improved Habitat. Implementation of the proposed ephemeral grazing practices may have a long-term, area-wide, beneficial impact on local insect populations. During years of abundant rainfall, high quantities of soil moisture will promote grasshopper hatching success and stimulate a good growth of annuals (filaree, desert Indian wheat, etc.), which serve as principal grasshopper forage.[24] The reservation of annual forage beyond the 50% livestock utilization level will provide an abundance of succulent spring herbage for herbivorous insect populations.

• Custodial

Information concerning the projected influence of custodial grazing practices on local invertebrate densities and diversities is unavailable.

(2) Vegetation Manipulation

• Habitat Conversion

Conversion of overgrazed plant communities, dominated by relatively unpalatable vegetation, to associations composed largely of high-quality forage species, would change regional invertebrate community structures. The manipulation of 1920 acres of blackbrush and 705 acres of pinyon-juniper woodland through burning and chaining, respectively, will convert the invertebrate component of these communities from brush- and woodland-adapted arthropods to insects and spiders which are successful in grassland-type habitats. Directly following brush and tree removal, invertebrate biomass will decrease rapidly due to habitat loss. As new vegetation growth appears, however, populations of grassland-inhabiting spiders and insects will become established. Appendix F provides information concerning specific habitat requirements of ES area invertebrates.

j. Threatened and Endangered Species

(1) Grazing Systems

• Santa Rita, Rest Rotation, Deferred

- Improved Habitat. Improved vegetative production from the proposed rest rotation grazing systems would cause an overall improvement in the habitat quality of most threatened and endangered ES area animals. The increased growth of perennial grasses and forbs would provide additional forage for regional desert tortoise populations. The anticipated increase in cottontail rabbit, perching bird, and game bird densities would also promote higher ES area carrying capacities of zone-tailed hawks, peregrine falcons, Gila monsters, and desert rosy boas. Habitat improvement would be a long-term, area-wide, beneficial impact.

- Decreased Competition. The placement of relatively high livestock numbers in use pastures within desert tortoise habitat would result in localized increases in forage competition. However, there would be

desert tortoise habitat improvement as forage increased during periods of pasture rest. Competition within use pastures would be greatest during initial implementation of the grazing systems. As forage abundance and quality improved, desert tortoise/livestock competition would be reduced, eventually rendering the conflict insignificant. This would be a long-term, area-wide, beneficial impact.

- Ephemeral

  - Forage Reservation. Forage reservation on proposed ephemeral allotments for wildlife, watershed, and seed production would provide additional food and cover for desert tortoises, Gila monsters, and desert rosy boas. Herbivores would benefit from the reserved vegetation, while predatory species would benefit indirectly from the increased game bird, amphibian, insect, and perching bird populations. This beneficial impact would be area-wide and long-term.

- Custodial

  - Impact Uncertain. The impact of proposed custodial grazing on threatened and endangered ES area vertebrates is unknown.

  - Attraction of Predators. An adverse, localized, long-term impact may result from the attraction of predatory mammals and snakes to the immediate vicinity of new water developments, thus increasing the potential for threatened and endangered animals to be preyed upon during foraging and watering activities. Overall, this impact would be negligible.

  - Destruction of Habitat. Permanent removal of 60 acres of native vegetation for the construction of additional earthen reservoirs, water catchment sites, water storage tanks, and other related range improvements would be a localized, long-term negative impact on threatened and endangered animals through direct habitat loss. Desert rosy boas, Gila monsters, and desert tortoises would be exposed to losses of protective cover and forage resources. Peregrine falcons and zone-tailed hawks would experience reductions in food supplies through losses of prey habitat. The impact of habitat loss on threatened and endangered species would be localized, long-term, and relatively small.

(2) Water Development

- Improved Water Supply

The development of 251 additional ES area water sources would promote increases in amphibian, insect, and perching bird ranges and population densities. This may in turn increase zone-tailed hawk, peregrine falcon, desert rosy boa, and Gila monster carrying capacities near desert water sites. The construction of earthen reservoirs would also develop new habitat for migrating ducks and geese. These waterfowl would provide additional prey resources for peregrine falcon and zone-tailed hawks during the spring and fall. The overall impact of improved ES area water supplies on threatened and endangered animals would be long-term, area-wide, and beneficial.

k. Riparian

(1) Grazing Systems

- Exclosure Development

Livestock grazing will have little or no direct affect on riparian habitat, since fences will be constructed around ES area springs to exclude large mammals.

(2) Spring Development

- Alteration of Riparian Habitat

The development of 22 ES area springs will result in the temporary disturbance of 5.5 acres of highly productive riparian habitat. Protective fencing of springs in conjunction with the establishment of spring boxes and water troughs will provide additional protection for spring sites. However, horizontal well drilling activities and/or the construction of collection pipes will temporarily disturb amphibian, small bird, reptile, and predatory bird habitat within local riparian areas. Species which would experience an initial negative impact from spring development include zone-tailed hawks, marsh hawks, western garter snakes, western rattlesnakes, black-tailed rattlesnakes, leopard frogs, canyon treefrogs, Great Plains toads, white-winged doves, and house finches. Nevertheless, the anticipated long-term impact of spring development is that riparian plant and animal habitat will be protected through the maintenance of sufficient reserves of free water at spring sites.

## 7. Land Use

### a. General Land Use Characteristics

(1) Ownership and Land Use Patterns. The dominant use of the land for ranching and livestock grazing activities within the study area will not be dramatically altered by the proposed grazing systems. The other impacting actions will not affect current or future land uses. Furthermore, it is anticipated that, although the AMPs reflect multiple-use considerations in accord with BLM policies, other uses will not take place to an extent which will modify the existing character or type of activity within the study area.

There has been, and no doubt will continue to be, speculations on the part of the permittees to sell their private lands. Some of this speculation has been engendered by the proposed action because of the ranchers' antagonism towards and dislike of increased government "control." The sale of land for development, therefore, is seen as a possible economic means to either continuing the ranch operation or removing oneself from an unacceptable position. Either course of action would affect the current land use. Given the extensive overcapacity of subdivision development, however, and the likely effort of the state to curtail this type of activity, it would appear that such changes would be very slow and minimal. More likely, land exchanges will continue to be for or to allow grazing purposes.

Growth in the Kingman area will occur mostly in areas already subdivided but not developed. Some lands, mostly private, in allotments 18A, 24C, 53C, and 74C may be developed as a result but this is not determinable at this time. Moreover, only 21.4 square miles of the 52.7 square miles currently available in urbanized areas in the county will be needed by the year 2000.

The major area of development will be around Kingman, as noted above, and in the Sacramento Valley. This latter area includes the private lands of allotments 10A and 56A. Other areas of possible development are at Chloride, 20A, Dolan Springs, 30A and 58A, and Meadview, 29A. Some development is also likely at Bullhead City and Katherine Landing, both surrounded by NPS lands.

(2) Uncontrolled Lands. The extent to which remote subdivision development has occurred and will occur within the study area is of some concern. As indicated in Chapter II, subdivided lands in the county cover 402 square miles with only 13 square miles being utilized. The Mohave County Planning and Zoning Commission indicates that 8.3% of the existing acreage, or about 20 square miles, will be needed for urban and suburban development in the year 2000. The proposed action will not, however, affect or cause this growth in development. The extent to which any rancher participates in the growth as a result of the proposed action is not predictable.

While the net changes in land use under these possibilities are not significant, the pressure to fence the uncontrolled lands is likely to increase. By the year 2000 this would mean approximately 33 square miles would be unavailable for grazing. The proposed AMPs, however, do not currently account for the forage available on these uncontrolled lands. Therefore, the impact on the rancher will be one of inconvenience and loss of forage in the allotments noted in (1) above if such lands are fenced.

(3) Other Land Use. The proposed action will also have little impact upon other existing uses in the study area. Right-of-way lands will undoubtedly be required in the future and it is expected that right-of-way corridors will be established as shown in Figure I-18. Similarly, scenic belts, communication sites, and R&PP acquisitions will be designated. Field studies will be made to assess unauthorized uses and their future disposition.

(4) Controls. An indirect yet beneficial effect of improved management of the public lands as represented in the AMP objectives is the extent to which it points to the desirability and perhaps even the necessity of the county developing a more detailed comprehensive land use paln. Some criticism has been levied against present planning efforts due to the lack of detail and specificity in terms of the types of land use or categories which can exist in designated districts. Assuming that the AMPs and related public regulation will bring a certain degree of stability to land utilization in the county and study area, it is anticipated that in the development of comprehensive land use plans for the county there will be greater specificity in terms of designated future zoning classifications and allowable activities within the different designations.

It is also anticipated that the proposed action will stimulate increased cooperative efforts in land use management among the several governmental agencies as discussed in subsection 13 below. The impact of this will be to reinforce current land use patterns and activities and provide for more clearly defined and compatible land use designations.

(5) Lands Identified for Disposal. The disposal or exchange of public lands as indicated in the MFP decisions (see Chapter I) is likely to take place at some indefinite time in the future. Similarly, the cancellation of exchange classifications, such as Bonelli Bay and Temple Bar, and consolidation of public and private lands through exchanges are also likely to occur. These exchanges, however, will not alter the basic objectives or proposed activity contained in the AMPs. Further, the four custodial allotments designated for disposal (numbers 24C, 48C, 72C, and 77C) are likely to be exchanged at some indefinite date in the future. Similarly, the 70,793 acres that are within AMP allotments (see Table I-12) will probably be disposed of with the current land use remaining.

b. Recreation

(1) Recreational Use Planning. A critical factor in assessing the potential recreational uses and benefits in addition to the impacts on the recreational resources of the ES area is the reliability of the data base and the recreational planning analysis. The limitation of this factor in the AMPs is discussed below. The consequences of the limitation are an inability to fully assess the impact as the potential use is not completely quantified. Furthermore, the AMPs are not consistent in providing for specifications to protect or enhance the recreational resource.

- Present Visitor Use

Collection of reliable visitor use data in an area as large and remote as the ES study area is difficult. A system combining traffic counts, interviews with ranchers in the area, interviews with local ORV and rockhounding clubs, and NPS recreation information is the source of recreation visitor use figures in the AMPs. The accuracy of these figures cannot be validated.

Implementation of the AMPs will not have any appreciable impact on visitor use in any foreseeable manner.

- Future Visitor Use

A reliable systematic method for the determination of future use data has not been utilized in the development of the AMPs. Future use figures in the AMPs for non-hunting recreational activities are calculated as a combined function of anticipated population growth in the planning area and current visitor use estimates. Current use figures and anticipated growth trends may not accurately reflect the actual situation. Future use figures computed from these estimates are correspondingly erroneous, as projections of future use in the AMPs cannot account for changes in the regional significance of the area, changes in public recreation interests and activities, and changes in recreation equipment technology. Future demands for recreation in the unit may shift from a predominantly local base towards a regional base.

BLM projections for future hunting participation in the ES area were calculated on the basis of anticipated growth patterns of game populations. Increases in hunting participation, at least for big game, are assumed to parallel increases in game populations. Traditionally, hunters in Arizona have drawn all of the big game permits issued, a trend which supports the preceding assumption.

Hunter use projections for small game, upland game, and predators are less reliable. Hunting permits are not required for these game species; therefore, hunting participation cannot be accurately predicted on the basis of permit issues.

- Benefit/Cost Analysis of Recreation

Qualities which are essential to the total value of the recreation experience, such as scenic resources or access via ORV travel, cannot be easily (if at all) calculated in economic terms. Assessment of difficult-to-quantify non-dollar recreation values has not been undertaken in the AMPs. Consequently, analysis of AMP benefits and costs have not considered non-dollar recreation values.

Recreation is treated only as a benefit in the BLM analyses based on wildlife improvements and corresponding increases in hunting opportunities. Recreation improvements involving specific investments are not called for in the AMPs; therefore no recreation costs are recognized.

The net AMP recreation benefit is determined by summation of the values of a hunting day multiplied by the expected increase in hunting days at full AMP effectiveness, multiplied by a 15-year capitalization factor for each species hunted. The suspect reliability of the component hunting data in the calculations places doubt on the reliability of the computed benefit.

A more serious limitation of the AMP recreation benefit analyses stems from the exclusion of data from the evaluations. Dollar valuations for non-hunting activities and non-hunting activity use figures were not used in the calculations, excluding the benefits of these activities from the benefit/cost ratio analyses.

(2) Impacts on the Recreational Resource. The proposed impacting actions affect the recreational environment on both an area-wide basis and within each allotment. In general, it appears that the proposed action will not appreciably affect recreational activities or opportunities except as noted below.

- ES Area-wide Impacts

  - Grazing Systems. Proposed within objectives of each AMP are management considerations that will enhance vegetative cover throughout the ephemeral and perennial range. This improved range forage condition will result in beneficial effects for visual-scenic qualities, and wildlife habitat and the related wildlife-hunting relationships.

Similarly, most AMPs contain management actions that call for either the treatment of wildlife as having priority over domestic livestock, or as secondary consideration. These proposed actions will have the beneficial effect in the long term of increasing portions of the wildlife populations, thereby improving the opportunities for observing and hunting.

  - Water Developments. Water developments specified within the AMPs will enhance wildlife resources, which will improve the opportunities for viewing and hunting.

- Range Improvements. Development of two-track access trails for construction purposes as outlined in the AMPs will have varying effects on the recreation opportunity resource. Increased access provides greater opportunity for ORV use, facilitating rock hounding, photography, hunting sightseeing, and general off-road travel. In contrast, the presence of these additional trails throughout the area can adversely impact primitive back country experiences, as more users detract from the recreation resource through their impact on one another, vegetation, wildlife, and general scenic qualities of the land. Furthermore, fences and pipelines specified in the AMPs may in some areas restrict or prohibit cross-country movement of recreationists such as ORV users, hunters, and hikers.

- Allotment Impacts

The following impacts on the recreational potential of the ES area on each allotment are anticipated to occur in the long term. These impacts are considered to be minor except where the potential primitive or scenic areas are not recognized or maintained in the AMP objectives. Continued use without protective measures can result in the irreparable quality loss of a resource for recreational (mostly sightseeing) purposes (see also subsections 9, 10, and 11 below).

- Big Ranch. The Mt. Perkins area within this allotment has been identified as having primitive value. The absence of any improvements in the area, the reduction of cyls from 750 to 461, and the fact that the area is at a high elevation indicate that the proposed action will not detract from the natural setting. Primitive values have not been accounted for in this AMP.

- Gediondia and Ft. McEwen. These allotments contain the Willow Springs area having primitive values. The AMP has not considered these values. As the condition of the range is generally fair to poor, continued livestock grazing will adversely impact the vegetation and wildlife and detract from the natural setting and recreational potential, particularly in the near term.

The Ft. McEwen allotment borders Lake Mohave. Licensing arrangements specify that the permittee will control the livestock and thus prevent conflicts with recreational users along the shoreline.

- CQT and Cedar Canyon. The Windy Point-Pack Saddle area within these allotments has been recommended for designation as a natural scenic area. Only a half acre is disturbed for two wells, so the present integrity of the natural and scenic qualities will be maintained. Provision for the reservation of forage for wild horses will be beneficial, thereby enhancing the recreational opportunity for observing and photographing the animals.

- Portland Spring. As this allotment borders Lake Mohave, licensing arrangements specify that the permittee control the livestock to prevent conflicts with water-based recreational activities. The proposed exclusion of range improvements will also preserve the scenic integrity as viewed from the high use area of Lake Mohave.

- Black Mountain and Silver Creek. The three water developments and one-half mile of pipeline which will be constructed in the Mt. Nutt area having primitive value are expected to have an immediate short-term effect of soil disturbance. Livestock gathering is not expected at these water sources as the waters are distributed by pipeline elsewhere. No additional long-term impact is anticipated that will adversely affect primitive values.

- Diamond Bar/Gold Basin. The North Music Mountains natural scenic area is included within the allotment. The windmill, dirt tanks, and three miles of fencing will minimally detract from the scenic quality and not affect the undisturbed natural resource of the Grand Wash Cliffs.

- Dolan Springs. This allotment includes part of Mt. Tipton natural scenic area. New range improvements are excluded from the area. The proposed action will detract from the potentially undisturbed natural resource recreation area to the extent that cattle reach the higher elevations for forage.

- Mt. Tipton. Designation of a 700-acre Mt. Tipton natural scenic area in the northeast corner of this allotment is planned. The continued grazing will detract from this potentially undisturbed area through the impact on soil, vegetation, wildlife, and water resources.

Nineteen-hundred twenty acres of blackbrush are proposed for burning and seeding. This will result in the destruction of existing habitats and the scarring of the land in the short term. In the long term there will be a conversion of habitat which will restore the recreational use. The value of this change, however, is not quantifiable.

- Clay Springs. The Clay Springs allotment, almost in total, has been identified as a natural scenic area, but has not been addressed as such in the AMP. The three and one-quarter mile of pipeline, two miles of fence, and existing access road to the Hualapai Reservation will detract from the scenic quality of the area as it combines with the existing fence line and will cut the natural scenic area in half.

- Truxton Canyon. The chaining and seeding of 705 acres of pinyon-juniper woodland will not have any significant effect on or detract from recreational value in either the long or short term.

- Other Allotments. The recreational values in the following allotments are not expected to be impacted in any noticeable or significant way: Mud Springs, Thumb Butte, Curtain, Pine Springs, Hackberry, Castle Rock, Crozier Canyon, Stockton Hill, Upper Music Mountain, Music Mountain, Canyon Ranch, Cane Springs, and Mineral Park.

c. Agriculture and Forest Products

Agricultural activity is not expected to be impacted or changed by the proposed action as the existing 600 acres in use on private land is fenced off from livestock use. It is expected that this use will remain

intact except for unforeseen reasons. The 10-acre farm operated by one permittee may or may not stay in use, depending on the choice of and usefulness to the owner. No agricultural uses are proposed and it is unlikely that such activities would be further introduced into the study area because of any grazing need such as for supplemental forage. A further restraint on the expansion of farming is the reluctance of the ranchers to farm, capital cost requirements, and the lack of a suitable irrigation system and an easily accessible low-cost water supply.

As there are no existing forest product activities on the public lands within the ES area, this land use will not be impacted. Furthermore, the potential for harvesting any timber or vegetative products is extremely limited except for some localized harvesting of Yucca schidigera. This activity is not related to or caused by the proposed action. Harvesting of the Yucca only marginally affects grazing as cattle will eat the seasonal flowers and fruits. On occasion livestock have been known to eat the Yucca leaves in desperation under poor range conditions.

d. Livestock Grazing

The following discussion focuses on the impacts of implementing the AMPs. Range improvements are discussed within this context rather than as specific actions as they do not directly result in land use impacts.

(1) Land Use. The current land use patterns of livestock grazing are not expected to change significantly because of the proposed action. While there may be some shifts in land ownership as discussed elsewhere in this subsection, grazing uses will remain approximately the same. It is also possible that some smaller ranch units (less than 100 cyls) may discontinue grazing for economic or other reasons. Further, some acreage may be sold for subdivision use as noted above.

The current livestock and range management practices, such as cow/calf operations, breeding practices, shipping dates, and culling practices, will generally not be affected by the proposed action. Herd composition will be the same as discussed in subsection 12 below, although steer and heifer weights are expected to increase by 10% in the long term.

The implementation of the AMPs will require an initial reduction of 21% in AUMs, or 1602 cyls, and a subsequent increase of 15% in AUMs, or 1034 cyls. The initial adjustments will involve a decrease in 19 allotments, no change in three, and an increase in one as shown in Table I-3. The number of permittees with more than 400 cyls will decrease from 7 to 5 initially and return to 6 eventually. The effects of these changes are discussed in subsection 12 below. The three-year average AUM use versus allowable use is shown in Table III-6.

(2) Livestock Adjustment to Rest Rotation. Cattle are social animals and creatures of habit. Any significant change in their habitual use patterns of range unit through concentration change in season of use, and change in pastures will have negative impacts upon their well-being and productive capability.

TABLE III-6

THREE YEAR AVERAGE (1974-77) AUM ACTUAL USE VERSUS ALLOWABLE USE, ALL ALLOTMENTS EXCLUSIVE OF EPHEMERAL

| Allotment Name and Number | | Current Allowable Use (AUMs)[a] | Actual Three-year Average (AUMs) | Difference |
|---|---|---|---|---|
| Big Ranch | 7A | 5,760 | 3,247 | - 2,513 |
| Black Mountain | 10A | 3,132 | 1,988 | - 1,444 |
| Cane Springs | 15A | 4,896 | 4,896 | - |
| Canyon Ranch | 17A | 2,304 | 1,370 | - 934[b] |
| Castle Rock | 18A | 539 | 539 | - |
| Cedar Canyon | 19A | 3,486 | 3,486 | - |
| Clay Springs | 23A | 114 | 110 | - 4 |
| CQT | 20A | 4,612 | 4,273 | - 339 |
| Crozier Canyon | 26A | 11,213 | 10,697 | - 516 |
| Curtain | 27A | 282 | 212 | - 70 |
| Diamond Bar/ Gold Basin | 29A | 6,372 | 3,229 | - 3,143 |
| Dolan Springs | 30A | 1,752 | 1,238 | - 514[b] |
| Ft. McEwen | 34A | 2,676 | 2,675 | - 1 |
| Gediondia | 36A | 773 | 753 | - 20 |
| Hackberry | 42A | 3,640 | 3,648 | + 8 |
| Mineral Park | 55A | 1,478 | 1,306 | - 172 |
| Mt. Tipton | 58A | 634 | 565 | - 69 |
| Mud Springs | 56A | 2,209 | 1,851 | - 358 |
| Music Mountain | 57A | 2,555 | 2,494 | - 61 |
| Pine Springs | 60A | 499 | 292 | - 207[b] |
| Stockton Hill | 66A | 552 | 450 | - 1-2 |
| Truxton Canyon | 70A | 588 | 588 | - |
| Upper Music | 71A | 2,505 | 2,505 | - |
| Portland Spring | 61A | | Ephemeral[c] | |
| Silver Creek | 65A | | Ephemeral[c] | |
| Thumb Butte | 68A | | Ephemeral[c] | |
| Total | | 62,571 | 52,412 | -10,159 |

[a]Current allowable use (AUMs) on Federal lands portions of allotments and exclusive of custodial.

[b]Single-year data (Pine Springs and Canyon Ranch); initial year following purchase, did not run full complement (Dolan Springs).

[c]Ephemeral Allotments -- no allotted allowable use.

Note: The three-year average (1974-77) actual licensed use (AUMs) for the allotments within the ES area exclusive of ephemeral ranges and custodial lands has been 52,412. Hence, the combined allottees have been licensing 16.24% fewer AUMs than their current allowable use.

The concentration of livestock will result in their utilizing less palatable forage plants as the opportunity for more selective grazing is reduced. Livestock will initially respond to concentration in a single grazing unit by walking the fences, hence spending less time in actual grazing. Negative reflections of a short-term nature would be weight loss, potential reduction in calf crop percentage, and lighter calves. As livestock become adjusted to the periodic pasture changes as required, and replacement animals remain in the herd, the potential for improved animal product production in terms of calves and pounds of beef is enhanced.

(3) Suitability of AMPs to Present Range Condition. There is no long-term local grazing history that would support the premise that the rest rotation grazing systems as proposed will not have initial negative impacts. The present relative condition of the range within the ES area might indicate that the initiation phase of rest rotation will have negative impacts upon the range resource in some of the allotments in poorer condition. The governing criteria of stocking at 90% of estimated grazing capacity and pasture utilization up to 60% may be inadequate in some instances.

The marginal condition of the land resource within the ES area, coupled with the inherent climatic variability, and the transition of vegetative types varying from ephemeral, through ephemeral/perennial, to perennial, are restraints in arriving at grazing systems that are highly formalized and calendar oriented.

(4) Change in Season of Use. The localized, long-term positive impacts obtained from changes in season of use are reflected in the change in percentage plant composition as physiological rest periods are provided for forage plants. The change in season of use through intensive grazing management can favor cool season or warm season plants depending upon the seasons of non-use.

Exclusive of the three ephemeral allotments, the other 23 allotments within the ES area will encounter changes in the season of use as the grazing systems -- Santa Rita, three-pasture rest rotation, four-pasture rest rotation, and deferred grazing -- are imposed.

(5) Improved Forage Production/Range Condition. The long-term benefits that would accumulate from improved range condition due to intensive grazing management would be area-wide.

The gross improvement in range condition is reflected in additional forage production within the ES area. Commensurate with increased forage production would be an increase in livestock product production through improved calf-crop percentage and heavier calf weights, resulting from the improved condition of the mother cow. All aspects of the area livestock industry would benefit economically in additional pounds of beef originating from the allotments within the ES area. Though there would be variance in the benefits to each allotment, the total impact in the area would be positive, of a long-term nature, and extensive.

(6) Custodial Management. The implementation of AMPs will have no impact upon the eight allotments within the ES area that are managed wholly as custodial, nor upon portions of seven other allotments so managed.

(7) Ephemeral Ranges. The implementation of AMPs will have no effect upon the three allotments that are designated entirely ephemeral, nor upon the designated ephemeral portions of three other allotments, in terms of livestock using the land.

e. Mineral Resources

The impact of the grazing systems on mineral resources is negligible. Grazing activities do not preclude the further exploration for these resources, such as is being presently done. Similarly, extension of the Duval Mine would not hinder, nor conversely would it affect grazing because of its location. This would also be true of other mine developments that would mostly be located in the more remote, less accessible, and rough terrain of the ES area.

There does exist the possibility of Red Lake being mined for the salt underlying it. Development of this resource would not be limited by grazing. In the short term, if this mining were to occur, grazing would be minimally adversely affected in a very localized area. Once mining were in operation, there would not be any conflicts with grazing use.

There are some sand and gravel operations near Kingman on the fringe of some grazing allotments. With any increased building activities in the future, increased demand for these materials may necessitate further use of 10-15 acres. The land would be removed from grazing. This possibility, however, is not affected by the proposed action and does not involve public lands.

f. Transportation

It is not anticipated that the proposed action will have major impact upon the existing transportation network. As indicated in Chapter II, a great deal of concern within the study area focuses upon the potential economic impacts of the completed I-40 bypass system upon existing, smaller cities such as Hackberry, Truxton, and Valentine. In addition, there is concern that the completion of the system may also negatively influence business and personal services in Kingman which have traditionally been utilized by tourists driving between Flagstaff and Los Angeles. Another concern is the generally poor maintenance and limited capacity of the existing U.S. 93 connecting Las Vegas, Kingman, and Phoenix. In either case, it is not anticipated that the implementation of the AMPs will either affect the construction or use of the I-40 bypass or impact U.S. 93.

The improvement of the transportation network in Mohave County over the next 15 years will probably be in accordance with the proposal of the County Planning and Zoning Commission. These improvements will be primarily directed towards maintenance and upgrading of existing roads. They will minimally affect or be affected by grazing activities. While they will improve access and circulation for existing and new residents and increase recreational opportunities, they will not result in any major land use changes. The implementation of the proposed action will similarly have no effect upon the other modes of transportation (bus, rail, and plane) nor result in any related land use changes.

8. Natural Hazards

a. Flooding

(1) Grazing Systems. The proposed grazing systems will result in decreased surface runoff and increased water retention in the long term. The former impact, particularly as it reduces runoff peaks, will occur as a result of improved plant vigor and increased ground cover (plant density). This impact will not reduce flooding potential but it will slightly reduce flood magnitude as it is related to different soil associations. The amount of rock outcrop, coarse texture, and infiltration characteristics determine these variations with no change expected on steep or rocky areas. Further, the quantity of soils having a moderate to high runoff potential is small, and they are mostly located in small outcroppings between isolated hills and not in the flood areas or principal valleys. In the short term, the flood hazard will be similar to existing conditions. The flooding of the Red Lake area will also continue as in the past.

The runoff and flood potential for the three ephemeral allotments will not change from existing conditions. The surface-water flows are localized and occasional and no data exist for any determination of flow or occurrence. Intense and sudden floods will continue to affect urban settlements, such as occurred in 1977 at Bullhead City with little or no effect on the ephemeral range.

The flooding potential and hazard on the custodial allotments, although not determinable, is expected to increase with further range degradation. This will mostly affect some subdivision and custodial lands in the southern part of the Hualapai Valley.

(2) Water Developments. The surface water to be harvested and stored as the result of the construction of surface runoff aprons and catchments is only slightly over 500,000 gallons. Neither this storage nor the related facilities will affect the potential for flooding or any related flood hazards. The construction of water developments will disturb 156 acres over four years and throughout 23 allotments. The potential for flooding as a result will be extremely minimal and the hazard nonexistent (see also Soils, subsection 3 above).

(3) Range Improvements. Any soil disturbance that will occur during the related ingress, egress, and on-site construction of various range improvements will temporarily increase the potential for and the hazards of flooding. This impact, however, will be minimal as only 150 acres, mostly fencing, are involved over a four-year period. Further, these facilities are remotely located and isolated, and the largest amount of disturbance at any one location is 32 linear acres for fencing on the Black Mountain allotment.

(4) Vegetative Manipulation. The projected chaining of approximately 705 acres of pinyon-juniper on the Truxton Canyon allotment could have localized, short-term adverse impacts relative to flood potential and hazards. This is due primarily to the removal of the vegetative canopy cover which eliminates the interception influence of the shrubs. Intense storm incidents before establishment of seeded species would adversely impact the improved site.

Approximately 1920 acres of blackbrush are scheduled for burning on the Mt. Tipton allotment. The short-term effect of this action could be to increase local flood potential from surface water flowing over the disturbed site before regeneration.

b. Fire

The improvement of the range condition as evidenced by increased herbage production will result in the accumulation of additional vegetative litter. This litter will serve as additional fuel above present conditions and therefore increase the fire hazard on a long-term basis. The potential impact would be negative and localized. It is likely that the limited number of fires that occur annually within the ES area would increase slightly, and to some degree increase in scale, particularly if standard fire suppression activities are not increased accordingly.

c. Dust Storms

(1) Grazing Systems. The improved range conditions resulting from the implementation of the proposed grazing systems will create a more favorable environment for water retention on-site. This condition ultimately favors additional plant growth and herbage production and is conducive to the reduction of the dust storm potential area-wide and on a long-term basis. (See also subsection 1 above.)

(2) Range Improvements, Including Water Development. During the construction of the range improvements, vegetation removal will be required. This would have a localized, short-term, adverse impact relative to dust storm potential. The potential would be directly proportional to the fineness of the soil texture in areas of vegetation removal. The valley areas containing parts of 13 allotments will be affected the most (see subsection 1). The eight custodial allotments will present a greater hazard as they are expected to deteriorate further and are located around Kingman and bracket the well-traveled I-40. The severity and occurrence of the storms are not determinable.

(3) Vegetation Manipulation. The initial impacts of vegetation manipulation (chaining of pinyon-juniper and burning of blackbrush) can be considered adverse, although on a localized basis. Mechanical shrub removal through chaining will have an immediate negative impact in terms of dust because of the heavy soil disturbance caused by the uprooting of the deep-rooted woody species.

The burning of blackbrush as a means of vegetation control has the potential of creating initial ash-dust storms depending on wind conditions. (See also subsection 1.)

Surface ground cover will increase with the establishment of adopted seeded grasses that result from the vegetation manipulation action. This additional plant material will have a long-term positive impact in the burned areas relative to dust storms.

## 9. Cultural Resources*

Survey of the ES area has not been comprehensive enough to date to expect that all areas would have recorded cultural resources. It has also not been complete enough to demonstrate that cultural resources are present or absent in the vicinity of all the proposed improvements. Sites known to be in the vicinity of proposed improvements are listed in Table III-7.

Although most sites will yield some information even after extensive disturbance, the quality of information declines in proportion to the amount of damage the site has sustained. Alteration of spatial relationships among artifacts, features, and natural deposites, together with loss and damage of archaeological speciments, constitute the primary means by which the integrity of cultural resources is threatened. Impacts have been quantified if possible, but in general neither the archaeological nor the management literature provides documentation of the effects of actions similar to that proposed.

### a. Grazing Systems

In general, the primary direct impact of grazing on cultural resources is the damage to fragile artifacts through trampling. Studies by Knudson[1] and Roney[2] suggest that fragile stone pieces may be substantially altered by cattle in areas of concentrated use and that 50% or more of the artifacts at sites in concentrated use areas may be affected.

It is expected that the concentration of stock around water sources would also result in local vegetative reduction and would consequently increase the potential for erosion. This could substantially disturb the placement of artifacts at any site in these areas.

(1) Santa Rita, Three-pasture and Four-pasture Rest Rotation, and Deferred Grazing Systems. The four systems are considered together because differences in their impacts on archaeological sites are negligible. All of the systems are likely to produce a short-term reduction of the rate of artifact damage. This reduction in impact would not apply to four allotments (Pine Springs, Crozier Canyon, Hackberry, and Clay Springs) which are not scheduled for an initial stock reduction.

Over the short term there will be continued adverse impacts from trampling. The rate will probably increase as stocking levels are increased. The cultural resources of Cane Springs and Big Ranch allotments will probably benefit most from the proposed grazing systems since initial reduction rates are relatively high and potential increases over the initial stocking levels are low. The cultural resources of Canyon Ranch and Black Mountain allotments would probably benefit the least since initial reduction rates are low and potential increases over initial stocking levels are high. On all allotments over the long term, depreciation rates should be nearly the same as current rates. The present rate of damage is unknown

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*References for this subsection follow on page III-93.

TABLE III-7

IDENTIFIED CULTURAL RESOURCES IN THE VICINITY OF PROPOSED LAND MODIFICATIONS (504 sites)

| Allotment | Site Number(s) | Type of Proposed Improvement | Land Status |
|---|---|---|---|
| Black Mountain | AR-02-020-550 (F:15:1, ASM) | Fence | Federal |
| Canyon Ranch | NA3774 | Fence | Federal |
| Castle Rock | AR-02-020-1010 | Pipeline, Trough | Federal |
| CQT | AR-02-020-1013 | Fence | State |
| Gediondia | AR-02-020-1048* | Fence | Federal |
| | AR-02-020-1049* | Fence | Federal |
| Mineral Park | HS-02-020-608 (F:12:2, ASM) | Storage Tank, Trough | Federal |
| | AR-02-020-609 (F:12:3, ASM) | Fence, Trough | Federal |
| | F:16:9, ASM | Fence, Trough | Private |
| Mud Springs | AR-02-020-550 (F:11:1, ASM) | Fence, Pipeline | Private |

*These sites are also partially on Mud Springs allotment.

but it is assumed that it is a low but steady rate of degradation. The principal loci of trampling damage are likely to be areas of repeated use, such as around watering stations, corrals, and salt licks.

As overall vegetative cover and litter increase under the influence of the formal grazing systems, there will be indirect impacts on cultural resources through decreased rates of erosion over the ES area as a whole, increased risk of wildfire, and increased recreational potential as a response to improved vegetative and wildlife habitat. Decreased erosion over the affected allotments would be a minor beneficial impact on cultural resources over the long term. The impact would be minor because current sediment loss is low (see Chapter II-B3) and only minimal gains in further reducing erosion can be expected. The increased risk of wildfires would have adverse impacts on cultural resources over the long term. Impacts would be similar to those discussed below for controlled burning but are potentially more damaging because of the higher temperatures and larger acreages anticipated to be involved. Increased access and recreational activity on allotments subject to the formal grazing systems may result in long-term adverse impacts to cultural resources through an increase in vandalism and illegal collecting of archaeological specimens.

(2) Ephemeral Grazing. The impacts of cattle on artifacts are probably less under this system than under any of the more formal grazing systems, since grazing is only periodic. Cultural resources should experience a slight deterioration over the long term. The effects of the concentration of cattle around watering stations should be similar to those of the other grazing systems.

(3) Custodial Management. It can be expected that artifact damage will continue to occur from the trampling actions of cattle and may occur with greater frequency than under the other grazing programs.

(4) Allotment Sensitivity to Grazing System Impacts. Ordering of allotments by raw ranks (see Chapter II-B9) is used to infer the sensitivity of the allotments to grazing impacts on cultural resources. Raw ranks also reflect the potential quantity of significant cultural resources within an allotment. Table III-8 shows allotments of high, moderate, and low sensitivity according to management category.

The three types of grazing management discussed above, ordered from greatest to least potential impact on cultural resources are custodial, formal grazing systems, and ephemeral grazing. It is clear from Table III-8 that allotments to be managed totally by custodial systems are those with the lowest cultural resource sensitivity. Although the rating does not preclude the existence of cultural resources within these allotments, it does suggest that relatively few cultural resource values would be affected by custodial management. In contrast, ephemeral allotments and allotments with ephemeral portions are rated as highly sensitive because of their critical cultural resource values. However, the least damaging grazing system is imposed upon these allotments. Allotments partially managed under formal grazing systems or allotments which have custodial portions are predominantly of high or moderate cultural resource sensitivity. Only

four allotments (Pine Springs, Curtain, Stockton Hill, and Castle Rock -- all relatively small) in these two management categories have low sensitivity ratings. It can be concluded that the least damaging grazing system, ephemeral management, is proposed for allotments of highest sensitivity while the most damaging system, custodial management, is proposed for allotments that are rated lowest for cultural resource value.

TABLE III-8

ALLOTMENT SENSITIVITY TO GRAZING MANAGEMENT PROGRAMS

| Management Category | Number of Allotments* By Sensitivity** High | Moderate | Low |
|---|---|---|---|
| Custodial Allotments | 0 | 0 | 8 |
| Allotments with Custodial Portions | 3 | 3 | 1 |
| Ephemeral Allotments | 3 | 0 | 0 |
| Allotments with Ephemeral Portions | 3 | 0 | 0 |
| Allotments with Formal Grazing Systems | 8 | 11 | 4 |

*An allotment was counted each time it fell into more than one category (e.g., Big Ranch is to be managed under both ephemeral and formal grazing management).

**Sensitivity - high = allotments with raw ranks of 1 through 12, moderate = allotments with raw ranks of 1 through 12, and low = allotments with raw ranks of 1 through 12.

b. Range Improvements

The proposed range improvements all involve some degree of surface soil disturbance and some involve subsurface alteration as well. In the ES area the cultural resources are generally simple surface scatters of artifacts. Consequently, all surface modifications may have severe effects on any cultural materials in the vicinity of the improvements. The actual potential for the improvements to result in impacts on the cultural resources depends on the area affected, the distribution of cultural resources, and the ground-disturbing nature of the improvements. In addition to the area that will be affected by each type of proposed improvement (see Chapter I, Figure I-4), there is potential for additional disturbed acreage through development of routes for construction and maintenance of improvements. Creation of these routes may involve crushing and displacing fragile artifacts through use of heavy equipment, displacing artifacts in the process of cutting the road or trail bed, and increasing access for vandals.

The areas of critical cultural resource (Chapter II-B9) are considered below in discussing the potential for proposed range improvements to impact cultural resources. The range improvements and types of vegetative manipulation are considered in order of decreasing impact.

(1) Spring Developments and Related Pipelines, Storage Tanks, and Fences. Spring developments, pipelines, and other facilities such as troughs, located around naturally occurring sources of water have a high likelihood of damaging cultural resources. The defined spring-sensitive areas include portions of canyons and washes downstream from a spring as well as the immediate spring area. Pipeline burial on stream terraces and benches in these areas could cause extensive damage to any sites in the path of the line. When vehicular traffic related to construction and maintenance crosses terraces in the vicinity of a spring, adverse impacts to cultural resources are likely to occur.

(2) Pinyon-juniper Removal. Pinyon-juniper removal through mechanical manipulation will cause severe adverse impacts to archaeological materials. The area to be affected within the Truxton Canyon allotment is relatively large (705 acres) and within a vegetation type known to have a relatively high density of cultural resources.

The adverse impacts of chaining pinyon-juniper have been documented in a controlled test.[3] The study showed that approximately 50% of all artifactual debris on a surface lithic site (similar to what one might except in the ES area) were lost during the removal of the vegetation. Of the remaining artifacts, 67% showed some horizontal displacement from their original position. Several pieces were broken through tractor operation. Even after a year of exposure to erosion and soil action, few of the lost flakes emerged on the surface.

The applicability of this study to the ES area is only tentative since this is the only study of its kind and since actual procedures may vary from those in the test case. The impacts are long term because the site, once disturbed, will never recover its initial spatial configuration.

(3) Blackbrush Burning. Burning of shrub vegetation may have adverse impacts on cultural resources in three possible ways. First, burning deposits a thick layer of carbon on pieces of surface pottery, making identification of temper, paste, and paint extremely difficult.[4] Second, it increases the visibility of sites, making them more vulnerable to vandals. Third, depending on the temperatures reached in burning, and the extent to which roots are burned, critical materials for dating archaeological sites may be contaminated. In addition, the cutting of a fire line could disturb cultural resources in its path. The blackbrush burn areas are not known to be especially sensitive to cultural resources, but the large surface area to be affected places this action high on the list of activities potentially damaging to cultural resources.

(4) Fences and Pipelines in Non-spring Areas. Fences and pipelines have the potential to adversely affect cultural resources. Together, pipeline and fence construction involves disturbance of sizable acreage. The primary effect of fence construction would be local disturbance of spatial relationships of artifacts where posts are set and in other areas impacted during construction. The principal impacts created by pipeline construction would be the effects of heavy equipment use and disturbance of surface and subsurface cultural deposits in excavating the trends. Indirect effects of trail and track development would hold as for other range improvements.

(5) Earth Reservoirs, Catchments, Storage Tanks, Horizontal and Vertical Wells, and Corrals. The principal impacts of these facilities consist of destroying spatial patterns of artifacts, features, and sediments through heavy equipment use during construction. Effects of tracks, trails, and roads are similar to those noted above. Corral use may involve additional impacts related to local vegetation denudation and erosion. Earth reservoirs will disturb the soil to a greater depth than most other proposed improvements.

(6) Cattleguards. Cattleguards have no appreciable effect on cultural resources. They are constructed on already-disturbed areas -- roads -- and are serviced by traffic along an already-existing roadway.

(7) Allotment Sensitivity to Range Improvement Impacts. Adjusted ranks (see Table II-54) represent the relative density of important cultural resources within an allotment. They promote an index to the likelihood that important cultural resources would be encountered during implementation of the proposed range improvement program. Adjusted ranks are the basis for discussing allotment sensitivity to proposed improvements (Table III-9).

By definition spring-related improvements will occur in critical spring areas, irrespective of overall allotment sensitivity ranking. Ohter proposed developments can be associated with specific allotments of high, moderate, or low relative densities of significant cultural resources. Blackbrush burning will be conducted on the Mt. Tipton allotment which has a rating of moderate sensitivity. Pinyon-juniper removal will be implemented on the Truxton Canyon allotment which has been assigned a high sensitivity rating. Allotments proposed for other types of range improvements -- earth reservoirs, fences, pipelines, storage tanks, etc. -- include eight allotments with high sensitivity, eight with moderate sensitivity, and five with low sensitivity rating. It should be emphasized that even low sensitivity allotments are likely to contain some cultural resources and that not all significant cultural resources are located in defined critical areas (see Chapter II-B9). It is apparent that the overall likelihood of encountering cultural resources during range improvement construction is high to moderate.

TABLE III-9

ALLOTMENT SENSITIVITY TO RANGE IMPROVEMENT IMPACTS

| Proposed Activity | Allotments Affected | Sensitivity Rating* |
|---|---|---|
| Pinyon-juniper Removal | Truxton Canyon | High |
| Blackbrush Burning | Mt. Tipton | Moderate |
| Range Improvements Other Than Spring-Related Developments | Black Mountain | Low |
| | Mud Springs | Low |
| | Curtain | Low |
| | anyon Ranch | Low |
| | Dolar Springs | Low |
| | Ft. McEwen | Moderate |
| | Castle Rock | Moderate |
| | CQT | Moderate |
| | Mt. Tipton | Moderate |
| | Diamond Bar/Gold Basin | Moderate |
| | Cane Springs | Moderate |
| | Hackberry | Moderate |
| | Clay Springs | Moderate |
| | Thumb Butte | High |
| | Gediondia | High |
| | Stockton Hill | High |
| | Mineral Park | High |
| | Pine Springs | High |
| | Upper Music | High |
| | Truxton Canyon | High |
| | Crozier Canyon | High |

*Sensitivity - high = adjusted ranks 1 through 12,
moderate = adjusted ranks 13 through 24,
low = adjusted ranks 25 through 36.

10. Natural Environmental Areas

a. Grazing Systems

With the introduction of rest and deferred rotation grazing systems, further controls will be placed on cattle numbers, utilization of key forage species, and the location and number of range improvements on each allotment. The improved range condition that will result from implementing these grazing systems will enhance the natural qualities and scenic attractiveness of the ES area, especially in the Joshua tree natural area and the four identified natural scenic areas, where improvements in vegetative condition will be the most noticeable. The other four natural areas will not be affected significantly by the grazing systems.

No specific designation or management plan has been provided in the AMPs or MFP decisions for the protection and enhancement of the identified natural environmental areas, wilderness areas, or areas of critical concern. The four areas having primitive values, however, do fall within the Black Mountain wildlife area and overlap with the area recommended as crucial area for wildlife (Figure II-30). Livestock are also excluded from the Black Mesa area which lies within the area reserved for wildlife (see Chapter I).

The three areas identified as having primitive and wilderness value (the fourth, Black Mesa, is in the area designated for wildlife only) will benefit from the AMP management practices such as initial cyl reduction, controlled forage utilization, and pasture station. It is noted, however, that the Ft. McEwen (Willow Springs) and Black Mountain (Mt. Nutt) allotments are in poor to fair condition; yet both in the long term will have nearly the same number of cyls as now.

The impacts on critical cultural and historical areas are discussed in subsection 9 above. Similarly, the crucial habitat areas are discussed in subsection 6 above and the visual resource impacts in subsection 11 below.

b. Water Developments and Range Improvements

Range improvements are expected to have minimal impact on the 13 identified natural environmental areas. Of the 2636 acres projected to be disturbed by construction of the improvements, approximately 36 acres will be on natural environmental area lands (Table II-55). The greatest number of these improvements is in the Willow Springs area where there are extensive water developments proposed for the Gediondia and Ft. McEwen allotments. Approximately 17 acres of primitive resources will be disturbed primarily by 9 spring improvements, 9 water storage tanks, and 10 miles of fences. Impacts on scenic quality will be insignificant since the improvements are located away from the major routes of travel. All other impacts on natural resource values will be minimal provided that resource clearances are undertaken and there is adherence to installation and siting specifications.

The North Music Mountains natural scenic area (Diamond Bar/Gold Basin) will have approximately eight acres disturbed due mostly to the construction of two earthen reservoirs and three miles of fence. Again, impact on scenic quality will be minimal given that location of these reservoirs and fences will be away from Pierce Ferry Road (see Chapter II-B11). Other places that will have land disturbances include the Clay Springs Canyon (5½ acres, mostly pipelines in Clay Springs allotment), Mt. Tipton (½ acre in CQT), Pack Saddle and Windy Point (½ acre in CQT) natural scenic areas, Joshua tree natural area (4 acres in Diamond Bar/Gold Basin), and the Mt. Nutt area (1 acre in Black Mountain). Impacts from range improvements in these areas will be small and considered insignificant particularly over the long term as new vegetative growth will tend to cover land disturbance if specifications are followed.

c. Improved Access

Restriction of ORV use to washes and existing roads and trails in those areas proposed for natural scenic designation and in the Black Mountains wildlife management area (as stated in Chapter I) will be a means of safeguarding the natural resources of these particular areas. Improved access by means of two-track trails to range improvement sites is potentially harmful to the scenic natural and primitive resources of the natural environmental areas within Diamond Bar/Gold Basin, Clay Springs, Gediondia, and Ft. McEwen allotments. However, these allotments are identified for protection from the impacts of increased access under the ORV restrictions outlined in the MFP decisions (Table I-14). The North Music Mountains (and that area common to Joshua tree) and Clay Springs Canyon natural scenic areas and the Willow Springs area lie within the above allotments and will be subject to these restrictions if and when they are established by BLM.

State-identified natural areas are not protected by ORV restrictions unless they are common to the BLM management areas. Of those natural areas, however, only Red Lake and Joshua tree will be impacted by ORV use. Neither of these areas will be impacted by the proposed action as range improvements are not planned for them or are minimal in number.

11. Visual Resources

The proposed actions -- grazing systems, water developments, range improvements, and vegetative manipulation -- that will impact the visual resources in the ES area will not meet the objectives of Class II VRM, but will for Class III and IV recommendations.

a. Grazing Systems

(1) Increased Wildfires. Implementation of rest or deferred rotation grazing systems will increase the hazard for wildfires in the ES area due to anticipated increases in fuels (litter and vegetation). This will vary according to vegetation type, but shrubby-grassland areas (as noted in Chapter II-B5) will probably have the greatest fire hazard due to the ease of ignition of these types of fuels. Short-term impacts will be adverse to the visual resource values due to immediate stark contrast between the burn area and surrounding natural landscape. The impacts will be area-wide and will be dependent on the size of a fire. The resultant burn areas meet the visual resource standards of any of the three classes in the ES area. Contrasts in form, line, color, and texture will gradually decrease over time until total recovery and enhancement of the area's resources are realized.

(2) Improved Range Condition. An overall beneficial impact on the visual resources will result from improved range condition. With this improvement, the quality of the scenery throughout the ES area will improve, although any changes will be over a long period of time and are likely to be moderate in nature. The basic contrast elements will be more suitable and all VRM classes will be affected, beneficially, excluding ephemeral and custodial rangelands.

(3) Contrast - Pastures. Development of pastures necessary for implementation of the grazing proposal will create a contrast between rested and used areas. Greater concentrations of livestock within pastures will cause a contrast in form, line, color, and texture between various pastures, used and unused. On allotments with a predominant grass type, visual contrast could be quite obvious even with the utilization constraints included in the grazing system.

Those allotments predominantly of grassland type and with portions lying in Class II VRM areas include Cane Springs, Cedar Canyon, Canyon Ranch, Truxton Canyon, Crozier Canyon, and the Valentine custodial allotment. Other areas where desert shrub or woodland species are dominant will show less distinction in visual comparison between pastures due to the nature of grazing in these areas. Class II areas will be affected by rest or deferred rotation grazing with an initial degradation of visual resources expected between rested and grazed pastures. Increased forage will lessen the contrast between pastures and may improve the quality of scenery somewhat, but impacts will be negative and long term, though small in nature.

b. Water Developments

Contrast - Facilities. The development of water retention and storage facilities, springs, and wells will have an adverse impact on visual resources in varying degrees but all impacts will be minor in nature. (For totals for the proposed improvements in Class II VRM areas, see Table II-57.) Those allotments in Class II areas which will have the most significant land disturbances are Diamond Bar/Gold Basin, Crozier Canyon, Gediondia, CQT, and Ft. McEwen. Of a possible 831 acres disturbed by construction of all proposed improvements in Class II units, 77 acres will be water developments. Of these, about 40 linear acres will be for pipelines. Soil and vegetative disturbances will create minor negative, short-term impacts on visual resources because of construction. With the general remoteness of Class II management areas, the long-term visual impacts of these improvements will be almost negligible, although they will not meet Class II VRM objectives. Objectives for Class III and IV management areas will be met in all instances by these water developments. Reduction of impacts from water catchments may be evidenced over the long term if revegetation of the sites as proposed is successful.

c. Range Improvements

Contrast - Fences and Roads. Approximately 37.5 linear acres of Class II area will be disturbed by the proposed fencing. The Gediondia, Mt. Tipton, Crozier Canyon, and CQT allotments will have the greatest proposed lengths of fence and thus pose the greatest potential for visual disturbances. Contrast between form, line, and color of the fence and landscape will be dependent on fence location, as determined by BLM visual impact analysis before construction and conformance with the specifications discussed in Chapter I. Adverse visual impacts will be long term but minor and local and are not expected to change the scenic quality or VRM classification.

Road construction is not planned in the ES area as a specific improvement; however, two track trails will be made where necessary by rubber-tired vehicles during construction of any new improvements. These trails will remain for improvement maintenance. There will be approximately 76 miles of pipeline and fence construction and thus trails in Class II areas. The access necessary to storage tanks, wells, springs, etc., is not determinable. Soil and vegetative disturbances in the immediate area of the trails will create contrasts of line and color with the landscape to a minor extent in the short term. The impacts in the long term will result from access for maintenance. It is expected to be minimal as the vegetation growth will improve and the trails will be used at most two to three times a year.

d. Vegetative Manipulation

(1) Contrast - Short Term. Severe localized impacts from chaining and burning of vegetation will be adverse as stark contrast in form, line color, and texture between surrounding landscape and the treated areas

will occur. All 1920 acres of blackbrush to be treated on the Mt. Tipton allotment will be burned in a Class III VRM area. However, the proposed site is very close to a Class II area and there will be a temporary negative impact on the scenic quality of that unit. Furthermore, since the burn area is in the foothills at the base of the Cerbat Mountains, which lie in a Class II area, scenic quality would be affected by the view from Pierce Ferry Road to the west. The blackbrush burn will not meet management objectives for Classes II, III, or IV in the short term.

The proposed chaining of 705 acres of pinyon-juniper on the Truxton Canyon allotment will also not meet short-term management objectives of VRM Classes II, III, or IV. This site lies within a Class II area. Impacts will be negative but minor in area extent. Scenic quality of the unit may be expected to drop temporarily from B to C, but management classification will not change.

(2) Contrast - Long Term. The short-term impacts of the chaining and burning of the areas above will be reversed over the long term with an ultimate beneficial effect on visual resources in the local area of the burn. Vegetative reproduction will reduce the contrast between the landscape and the chain and burn areas to the extent that the basic elements of contrast will be closely alike. The scenery quality of the respective burned and chained areas will increase but a grade change of B to A cannot be expected. Objectives of the VRM classes for these areas would be met in the long term.

12. Socioeconomic Conditions

a. Demographic Characteristics

The population impact of the proposed action will be minimal as population changes are likely to result from changes in employment opportunities in Mohave County other than in ranching. Further, the agricultural sector is expected to show a decline in job opportunities. The only new personnel relevant to the proposed action will be the five additions to the BLM staff required to implement the AMPs. Assuming that each BLM employee has 1.5 dependents, the population in-migration resulting from the proposed action will be about 13.

The makeup of the county population is expected to be similar to the demographic characteristics of the past decade, as described in Chapter II. These trends will not be affected by the proposed action. The ranch community is also expected to remain stable and homogeneous.

b. Employment

Employment impacts resulting from the proposed action will occur at the direct, indirect, and induced levels. There will be three different types of direct impacts: impacts on the ranching community, construction impacts of range improvements, and increases in BLM staff. These direct impacts will subsequently stimulate indirect and induced impacts.

Table III-10 shows the average annual direct employment impact in each of these categories. The largest employment impact will occur during the four-year construction period. However, even during this period, net employment impact will be only 18.4 person-years in 1980.

The total direct, indirect, and induced impacts of the program have been estimated in two ways: (1) using the employment multipliers provided by the County Planning and Zoning Commission, and (2) applying the income multipliers developed in Chapter II to direct employee income. The results of the two approaches are shown in Table III-11. As can be clearly seen, the Commission's employment multiplier of 1.18 produces a far higher estimate of total employment impacts than does the income multiplier. However, as noted in Chapter II, this estimate is considered high and the estimates of employment are therefore overstated.

The income multiplier suggests that indirect and induced employment will peak during the construction period. However, the total employment impact of 35 jobs in 1980 is less than 1% of total employment projected for Mohave County for that year. With the exception of the additional BLM staff, it can be expected that all the required employees will be from the existing labor force as opposed to coming from other areas.

TABLE III-10

NET CHANGE IN DIRECT EMPLOYMENT
RESULTING FROM PROPOSED ACTION*

| Year | Construction and Maintenance of Improvements | Ranch Operations | BLM Staff Increases | Total Net Change in Direct Employment |
|---|---|---|---|---|
| 1979 | 0.0 | 0 | 3 | 3.0 |
| 1980 | 15.4 | 0 | 3 | 18.4 |
| 1981 | 9.3 | 0 | 3 | 12.3 |
| 1982 | 7.3 | 0 | 3 | 10.3 |
| 1983 | 6.8 | 1 | 5 | 13.8 |
| 1984 | 0.1 | 1 | 5 | 6.1 |
| 1985 | 0.1 | 1 | 5 | 6.1 |
| 1990 | 0.1 | 3 | 5 | 8.1 |
| 1995 | 0.1 | 4 | 5 | 9.1 |
| 2000 | 0.1 | 5 | 5 | 10.1 |

*Net full-time equivalent employment is the difference between the employment levels which will occur if the proposed action is carried out and the employment levels which would exist under a continuation of present trends.

Sources: Bureau of Land Management and Arthur D. Little, Inc., estimates.

TABLE III-11

TOTAL EMPLOYMENT CHANGES
RESULTING FROM PROPOSED ACTION[a]

| Year | Total Direct Employment | Indirect and Induced Employment: Employment Multiplier[b] | Indirect and Induced Employment: Income Multiplier[c] | Total Employment: Employment Multiplier | Total Employment: Income Multiplier |
|---|---|---|---|---|---|
| 1979 | 3.0 | 3.5 | 2.2 | 6.5 | 5.2 |
| 1980 | 18.4 | 21.7 | 16.1 | 40.1 | 34.5 |
| 1981 | 12.3 | 14.5 | 10.6 | 26.8 | 22.9 |
| 1982 | 10.3 | 12.2 | 9.0 | 22.5 | 19.3 |
| 1983 | 13.8 | 16.3 | 10.1 | 30.1 | 23.9 |
| 1984 | 6.1 | 7.2 | 4.1 | 13.3 | 10.2 |
| 1985 | 6.1 | 7.2 | 4.2 | 13.3 | 10.3 |
| 1990 | 8.1 | 9.6 | 4.6 | 17.7 | 12.7 |
| 1995 | 9.1 | 10.7 | 5.0 | 14.8 | 14.1 |
| 2000 | 10.1 | 11.9 | 5.6 | 22.0 | 15.7 |

a. Estimates are of net full-time equivalent employment changes resulting from the proposed action which is the difference between the employment levels which will occur if the proposed action is carried out and the employment levels which would exist under a continuation of present trends.

b. County employment multiplier is 2.18. Estimates of indirect and induced employment are calculated by multiplying direct employment by 1.18.

c. Estimates of additional employment using the income multiplier are calculated by first estimating changes in total personal income and then estimating the persons supported by this additional income at \$11,600/employee. The income multiplier for Mohave County is 1.44.

Sources: Bureau of Land Management, Mohave County Planning and Zoning Commission, "Economic Analysis of Mohave County"; U.S. Department of Commerce, Bureau of Economic Analysis, Economic Information Systems; Arthur D. Little, Inc., estimates.

c. Income and Construction Impacts

(1) Income. The income impacts resulting from the proposed action will also be minor. The personal income resulting from the direct impacts of the proposed actions on construction activities, ranching income, and government employment are shown in Table III-12. The maximum direct impact occurs during 1980 and equals $423,540, less than 1% of the personal income in Mohave County for that same year.

The other source of income impacts resulting from the proposed action is the income earned at the indirect and induced levels. Based upon the methodology described in Appendix H, estimates of the indirect and induced income impacts of the proposed action are also shown in Table III-12.

The total income impact of the proposed action is the sum of the direct, indirect, and induced incomes (Table III-12). The maximum impact -- $609,900 -- occurs in 1980 when the income resulting from the proposed action equals less than 1% of the total county personal income for that year. The long-term income impact of the proposed action will be only $175,840.

(2) Range Improvement Construction Impacts. Construction activities related to the AMPs will begin in 1980 and extend through 1983. The subsequent related maintenance of activities will continue indefinitely. The most significant impacts* of these activities in terms of 1977 dollars are:

- The value of construction by both BLM and the 18 permittees will be approximately $1.36 million. The BLM expenditures will be $1.04 million, while out-of-pocket expenditures by ranchers will be approximately $210,000. In addition, the ranchers will contribute their own labor valued at $112,000 for the construction of various types of improvements on their land.

- The permittees will incur an annual out-of-pocket maintenance cost of approximately $8,200. In addition, they will contribute their own labor for maintenance annually, valued at approximately $32,800.

- The impacts of the program on the county will be small, localized, and accrue only to certain businesses.

- Impacts on the ranchers will be significant. Maximum annual encumbrances will be $125,000 in 1980, or approximately $17,000 more than current ranch income for all allotments.

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*For a detailed discussion on construction impacts, see Appendix J.

TABLE III-12

NET DIRECT, INDIRECT, AND INDUCED INCOME IMPACTS OF PROPOSED ACTION
INITIAL AND POTENTIAL STOCKING RATES

| Year | Components of Direct Income Impact: Construction and Maintenance[a] | Ranching[b] | BLM Staff Salaries | Total Direct Income[c] | Indirect and Induced Income[d] | Total Income[d] |
|---|---|---|---|---|---|---|
| 1979 | - | - | $39,000 | $ 57,760 | $ 25,410 | $ 83,170 |
| 1980 | $246,980 | - | 39,000 | 423,540 | 186,360 | 609,900 |
| 1981 | 148,760 | $ 800 | 39,000 | 279,260 | 122,870 | 402,130 |
| 1982 | 116,760 | 1,600 | 39,000 | 233,050 | 102,540 | 335,590 |
| 1983 | 109,700 | 2,400 | 65,000 | 262,280 | 115,410 | 377,690 |
| 1984 | 1,420 | 3,200 | 65,000 | 103,110 | 45,890 | 149,180 |
| 1985 | 1,420 | 4,000 | 65,000 | 104,290 | 45,890 | 150,180 |
| 1990 | 1,420 | 8,060 | 65,000 | 109,740 | 48,290 | 153,030 |
| 1995 | 1,420 | 12,090 | 65,000 | 116,270 | 51,160 | 167,430 |
| 2000 | 1,420 | 16,030 | 65,000 | 122,110 | 53,730 | 175,840 |

a. Value of unpaid rancher labor not included.

b. Ranch income calculated using O&M costs and stocking rate of 6,020 increasing to 7,054 cyls at 260 cyls/year.

c. Sum of all direct income sources times factor of 1.481 to account for additional income received from rents, dividends, transfer payments, etc.

d. Total direct income multiplied by income multiplier of 1.44 as determined from information taken from U.S. Department of Commerce, Bureau of Economic Analysis, Economic Information System.

Sources: Bureau of Land Management; American Ag International estimates; Arthur D. Little, Inc., estimates.

d. Livestock Grazing Activities

(1) Ranch Characteristics. The implementation of the proposed action will have short-term beneficial impacts on the local ranch community in the ES area because of the sale of excess numbers of livestock. There will also be a long-term adverse impact because of the loss of revenue from the decreased herd sizes until the potential productivity of the range is achieved and the estimated increase in AUMs is realized. The potential increase in AUMs is expected to be 15% over the initial stocking rate, as shown in Table I-3. The increase will be from 72,250 AUMs or 6020 cyls to 84,654 AUMs or 7054 cyls over a 20-year period.

Upon implementation of the AMPs, there will be 13 permittees with fewer than 400 cyls and 5 permittees with more than 400 cyls. The average size ranch for the 18 permittees (with 23 allotments) will be 262 cyls. In the future, the average ranch will have 307 cyls and there will be 6 ranches with more than 400 cyls, 3 with 300-400 cyls, one with 200-300 cyls, one with 100-200, and 7 with less than 100 cyls.

(2) Cattle Shipments and Sales and Market Characteristics. The cattle shipments and sales for Mohave County and the ES area are expected to be similar to existing patterns. Cattle shipments in the ES area will be lower than at present as there will be 1603 cyls initially and 569 cyls fewer eventually. While the market conditions will still resemble the cyclical variations of the past, cattle sales will be different in the long term. This will be due to the expected 10% increase in cattle weights, as noted in (5) below, as a result of better forage production.

(3) Herd Value and Composition. The herd composition and value for the initial stocking rate of 6020 cyls are shown in Table III-13. The value will be $1.53 million. There will be 1324 sale cattle worth $237,800 at the initial rate. The potential herd composition will be similar to present conditions, although weights will be increased for steers and heifers. As indicated in Table III-14, the herd inventory value will be $1.9 million for 7054 cyls. There will be 1552 sale cattle worth $303,300 at an average price of $189 per head. The current comparative values are $1.97 million total with 1677 sale cattle worth $301,200.

(4) Ranch Value. The effect of the initial stocking rate (6020 cyls) will be a decrease in value from $7.62 million to $6.44 million, or from $26.58 to $22.46 per acre. (See also Chapter II-C12.) The construction of the proposed range improvements over the 1980-1983 period will increase this value to $6.76 million, or from $22.46 per acre of private land to $23.57. This is $13.01 less than in 1977.

The long-term improvement in range conditions will result in an increase in value of $840,000, or $2.93 per acre for a total value of $7.6 million and $26.50 per acre. This will occur because of the higher stocking level of 7054 cyls and a 10% weight increase in steers and heifers. If an 85% calf crop efficiency is achieved along with the improved condition of the range the increase will be $1.22 million, or $4.25 per acre. The total value will be $7.98 million and $27.83 per acre.

TABLE III-13

TOTAL HERD COMPOSITION AND INVENTORY VALUE, 23 ALLOTMENTS - INITIAL STOCKING RATE WITH PROPOSED ACTION

| Herd Composition | Cyl | Price per Pound | Weight (lbs) | Value |
|---|---|---|---|---|
| 50% Producing Cows | 3,010 | 22¢ | 1,000 | $ 662,200 |
| 20% Replacement Heifers | 1,024 | 37¢ | 600 | 267,300 |
| 5% Bulls | 301 | $400 each | | 120,400 |
| 3% Horses, Milk Cows | 181 | $300 each | | 54,300 |
| 11% Steers (sale type) | 662 | 40¢ | 520 | 137,700 |
| 8% Heifers (sale type) | 481 | 34¢ | 435 | 71,100 |
| 3% Cull Cows | 181 | 20¢ | 800 | 29,000 |
| Subtotal | 6,020* | | | $1,342,000 |
| 50% Heifers** | 798 | 40¢ | 300 | $ 95,800 |
| 50% Steers** | 798 | 48¢ | 300 | 114,900 |
| Subtotal | 1,596 | | | $ 210,700 |
| Total | 7,616 | | | $1,552,700 |

*Includes cyls for custodial lands within the 23 allotments.
**Calves one day old to yearlings based upon 65% calf crop for producing cows and replacement heifers, less sale-type steers and heifers.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

TABLE III-14

TOTAL HERD COMPOSITION AND INVENTORY VALUE - POTENTIAL STOCKING RATE

| Herd Composition | Cyl | | Price per Pound | Weight (lbs) | Value | |
|---|---|---|---|---|---|---|
| 50% Producing Cows | 3,527 | | 22¢ | 1,000 | $ 775,900 | |
| 20% Replacement Heifers | 1,411 | | 37¢ | 660 | 344,600 | |
| 5% Bulls | 352 | | $400 each | | 140,800 | |
| 3% Horses, Milk Cows | 212 | | $300 each | | 63,600 | |
| 11% Steers (sale type) | 776 | | 40¢ | 572[a] | 177,500 | |
| 8% Heifers (sale type) | 564 | | 34¢ | 479 | 91,900 | |
| 3% Cull Cows | 212 | | 20¢ | 800 | 33,900 | |
| Subtotal | 7,054[b] | | | | $1,628,200 | |
| | 65% | 85% | | | 65% | 85% |
| 50% Heifers[c] | 935 | 1,428 | 40¢ | 330[a] | $ 123,400 | $ 188,400 |
| 50% Steers[c] | 935 | 1,428 | 48¢ | 330[a] | 148,100 | 226,200 |
| Subtotal | 1,870 | 2,856 | | | $ 271,500 | $ 414,600 |
| Total | 8,924 | 9,910 | | | $1,899,700 | $2,042,800 |

a. 10% weight increase.
b. Included custodial use area cyls.
c. Calves one day old to yearlings based upon 65% or 85% calf crop for producting cows and replacement heifers, less sale-type steers and heifers.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

The land value will be $3.31 million, the improvements $1.93 million, and the machinery $460,000. The cattle values will range from $1.9-2.04 million.

(5) Economic Operations of the Ranch. The average ranch expenses and returns for the initial stocking rate are shown in Table III-15. The total return of a 262-cyl ranch is estimated at $24,860 and expenses at $26,200. The ranch will, therefore, operate at a loss of $1,340.

The subsequent stocking rate of 7054 cyls will result in an average ranch of 307 cyls earning $3,200, as shown in Table III-16. This increase reflects additional cattle as well as improved weights of steers and heifers. If the rancher simultaneously improves herd management practices and achieves an 85% calf crop, the gain will amount to nearly $13,250. It is not unreasonable to assume that the 18 ranch units, or 23 allotments, can improve their calving percentage by 10-20% and realize 5-10% heavier sale weights through improved management coupled with higher forage production resulting from AMP implementation.

(6) Cost of Improvements. The private costs of all physical improvements to 20* allotments is $322,535. The cost per year per allotment is shown in Table III-17. The ability of the ranchers to absorb this cost is questionable. Total herd sales of $534,800 at the time of the construction period barely cover operating costs of $530,700 as is also shown in this table. In this breakeven situation the rancher would be extremely reluctant to take on this additional investment. Further, lending institutions would not consider this a healthy atmosphere for loans, as they prefer short-term loans currently at 10% or better. It is also noted that the inability of the ranchers to install improvements jeopardizes the proposed AMPs as many of the water developments are located on private land.

The sales return on the potential stocking rate will be $679,900 vs. O&M costs of $628,800 (Table VII-17). The rancher will achieve an estimated net return of $51,000 annually some 20-25 years in the future. With a higher calf crop, the net returns will be on the order of $257,800.

It is noted that four allotments with less than 100 cyls barely achieve a return even at the potential stocking levels. Even though their costs are on the order of $3,700-5,800 they are still not in a strong position. Similarly, three allotments will incur a substantial cost with a low number of cyls: Gediondia at 80 cyls with a $20,350 cost, Mud Springs at 178 cyls and $42,855, and Mt. Tipton at 90 cyls and $29,960.

(7) Indirect Economic Effects of Ranching. The direct, indirect, and induced impacts (all sources) on employment and income in the study area are described in b and c above. The ranch-related employment is indicated in Table III-18 to the year 2000. The net result is slightly less total employment than at present but still amounts to only about 50 jobs.

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*Six allotments have no improvements on private lands.

TABLE III-15

AVERAGE RANCH EXPENSES AND RECEIPTS - INITIAL STOCKING RATE WITH PROPOSED ACTION

| Expense Item | Percent of Total O&M Budget | O&M Costs* |
|---|---|---|
| Overhead | 23.2% | $ 6,080 |
| Labor | 15.3 | 4,010 |
| Machinery | 20.5 | 5,370 |
| Material | 12.3 | 3,220 |
| Custom Services | 1.5 | 390 |
| Interest | 9.0 | 2,360 |
| Depreciation | 18.2 | 4,770 |
| Total | 100.0% | $26,200 |

| Herd Composition | 65% Calf Crop |
|---|---|
| Cows | 223 |
| Replacement Heifers | 26 |
| Bulls | 13 |
| Market Steers | 72 |
| Market Heifers | 46 |
| Cull Cows | 22 |

| Receipts | Weight (lbs) | Price per Pound | Number of Head | Total Price |
|---|---|---|---|---|
| Cows (cull) | 800 | 20¢ | 22 | $ 3,520 |
| Bulls (cull) | 1,100 | 30¢ | 2 | 600 |
| Steers | 435 | 40¢ | 46 | 8,000 |
| Heifers | 520 | 34¢ | 72 | 12,740 |
| Total Receipts | | | | $24,860 |
| Total Ranch O&M | | | | $26,200 |
| Profit (Loss) | | | | $(1,340) |

*262 cyls with $100/cyl O&M cost.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Service; Arizona Agricultural Statistics.

TABLE III-16

AVERAGE RANCH EXPENSES AND RECEIPTS – POTENTIAL STOCKING RATE, 7,054 CYLS

| Expense Item | Percent of Total O&M Budget | O&M Costs* |
|---|---|---|
| Overhead | 23.2% | $ 7,200 |
| Labor | 15.3 | 4,700 |
| Machinery | 20.5 | 6,400 |
| Material | 12.3 | 3,800 |
| Custom Service | 1.5 | 500 |
| Interest | 9.0 | 2,800 |
| Depreciation | 18.2 | 5,600 |
| Totals | 100.0% | $31,000 |

| Herd Composition | Calf Crop | |
|---|---|---|
| | 65% | 85% |
| Cows | 261 | 261 |
| Replacement Heifers | 31 | 31 |
| Bulls | 15 | 15 |
| Market Steers | 85 | 111 |
| Market Heifers | 54 | 80 |
| Cull Cows | 26 | 26 |

| Type Livestock | Weight | Price | Calf Crop | | Calf Crop | |
|---|---|---|---|---|---|---|
| | | | 65% | 85% | 65% | 85% |
| Cows (cull) | 800 | .20 | 31 | 31 | $ 4,960 | $ 4,960 |
| Bulls (cull) | 1,100 | .30 | 3 | 3 | 990 | 990 |
| Heifers** | 479 | .34 | 54 | 80 | 8,800 | 13,000 |
| Steers** | 572 | .40 | 85 | 111 | 19,450 | 25,400 |
| Total Receipts | | | 173 | 225 | $34,200 | $44,350 |
| Total Ranch O&M Costs | | | | | $31,000 | $31,000 |
| Profit or (Loss) | | | | | $ 3,200 | $13,350 |

*307 cyls, $101/cyl (includes maintenance cost of new facilities).
**10% weight increase.

TABLE III-17

COST OF PROPOSED PRIVATE IMPROVEMENTS VERSUS ESTIMATED RETURNS

| Allotment | Initial Stocking Rate (cyl) | Cost of Private Improvements | O&M[a] Costs (000) | Initial[b] Herd Sales (000) | Potential Stocking Rate (cyl) | O&M[c] Costs (000) | Potential[d] Herd Sales (000) | Herd[e] Sales (000) |
|---|---|---|---|---|---|---|---|---|
| First Year | | | | | | | | |
| Ft. McEwen | 210 | $ 25,000 | $ 21.0 | $ 21.2 | 266 | $ 26.9 | $ 29.0 | $ 37.9 |
| Cane Springs | 354 | 2,975 | 35.4 | 35.7 | 389 | 39.3 | 42.5 | 55.4 |
| Mineral Park | 83 | 2,550 | 8.3 | 8.4 | 130 | 13.1 | 14.2 | 18.5 |
| Castle Rock | 30 | 5,825 | 3.0 | 3.0 | 42 | 4.2 | 4.6 | 6.0 |
| Gediondia | 50 | 20,350 | 5.0 | 5.0 | 80 | 8.1 | 8.7 | 11.4 |
| Upper Music | 186 | 1,800 | 18.6 | 18.7 | 230 | 23.2 | 25.1 | 32.8 |
| Mud Springs | 196 | 42,855 | 14.6 | 14.7 | 178 | 18.0 | 19.4 | 25.3 |
| Canyon Ranch | 357 | 28,250 | 35.7 | 36.0 | 471 | 47.6 | 51.4 | 67.1 |
| Diamond Bar/ Gold Basin | 782 | 57,975 | 78.2 | 78.8 | 1,033 | 104.3 | 112.8 | 147.1 |
| Total – Year 1 | 2,198 | $187,580 | $219.8 | $221.5 | 2,819 | $284.7 | $307.7 | $401.4 |
| Second Year | | | | | | | | |
| Crozier Canyon | 1,280 | $ 21,650 | $128.0 | $129.0 | 1,280 | $129.2 | $139.8 | $182.3 |
| Mt. Tipton | 59 | 29,960 | 5.9 | 5.9 | 90 | 9.1 | 9.8 | 12.8 |
| Cerbat/ Quail Springs/ Turkey Track | 369 | 20,000 | 36.9 | 37.2 | 445 | 44.9 | 48.6 | 63.4 |
| Total – Year 2 | 1,708 | $ 71,610 | $170.8 | $172.1 | 1,815 | $183.2 | $198.2 | $258.5 |
| Third Year | | | | | | | | |
| Stockton Hill | 31 | $ 4,800 | $ 3.1 | $ 3.1 | 40 | $ 4.0 | $ 4.4 | $ 5.7 |
| Black Mountain | 314 | 10,625 | 31.4 | 31.7 | 361 | 36.5 | 39.4 | 51.4 |
| Big Ranch | 425 | 11,050 | 42.5 | 42.8 | 461 | 46.6 | 50.3 | 65.6 |
| Total – Year 3 | 770 | $ 26,475 | $ 77.0 | $ 77.6 | 862 | $ 87.1 | $ 94.1 | $122.7 |
| Fourth Year | | | | | | | | |
| Dolan Springs | 150 | $ 25,880 | $ 15.0 | $ 15.1 | 194 | $ 19.6 | $ 21.2 | $ 27.6 |
| Hackberry | 446 | 3,340 | 44.6 | 45.0 | 446 | 45.0 | 48.7 | 63.5 |
| Curtain | 16 | 3,900 | 1.6 | 1.6 | 25 | 2.5 | 2.7 | 3.6 |
| Clay Springs | 19 | 3,750 | 1.9 | 1.9 | 65 | 6.5 | 7.1 | 9.3 |
| Total – Year 4 | 631 | $ 36,870 | $ 63.1 | $ 63.6 | 730 | $ 73.7 | $ 79.9 | $104.0 |
| Grand Total | 5,307 | $322,535 | $530.7 | $534.8 | 6,226 | $628.8 | $679.9 | $886.6 |

a. @ $100 cyl.
b. 65% calf crop, 56% of cyl @ $180/cyl.
c. $101 per cyl to include maintenance on improvements.
d. 65% calf crop, 56% of cyl @ $195/cyl.
e. 85% calf crop, 73% of cyl @ $195 /cyl.

**Source:** Arthur D. Little, Inc., estimates.

TABLE III-18

TOTAL RANCH-RELATED EMPLOYMENT
UNDER PROPOSED ACTION

| Year | Cyls Permitted | Direct Employment* | Indirect and Induced Employment** | Total Employment |
|---|---|---|---|---|
| 1977 | 7,623 | 38 | 9.74-16.21 | 47.74-54.21 |
| 1980 | 6,020 | 30 | 7.69-12.82 | 37.69-42.82 |
| 1985 | 6,280 | 31 | 8.02-13.37 | 39.02-44.37 |
| 1990 | 6,540 | 33 | 8.36-13.92 | 41.36-46.92 |
| 1995 | 6,800 | 34 | 8.69-14.48 | 42.69-48.48 |
| 2000 | 7,054 | 35 | 9.01-15.02 | 44.01-50.02 |

*Direct employment is based on assumption that 200 cyls are required to employ one person.

**Indirect and induced employment is expected to vary in direct proportion to the number of cyls which affects rancher spending in the community. Ranges of estimates conform to the range of production cost of $75-125 per cyl.

Sources: Bureau of Land Management; American Ag International estimates; Arthur D. Little, Inc., estimates.

e. Government Revenues

The effects of the proposed action on Mohave County will be a reduction from $1.37 million to $1.08 million initially and a subsequent increase to $1.34 million of assessed valuation. The tax impact will be a decrease to $75,600 and an increase to $93,800 in the long term (assuming a tax rate of $7 per $100 of assessed valuation).

The reduction in AUMs will reduce BLM grazing revenues. The initial reduction from 91,484 AUMs in the ES area to 62,342 will reduce BLM annual grazing receipts by $19,900,* assuming that the current price of $1.51/AUM is maintained. During the course of the proposed action, the number of allowable AUMs is expected to increase to 74,746, resulting in BLM revenues of $87,400. The amount available for these improvements will be $21,900.

The State Land Department's receipts will not be affected by the proposed action unless some ranchers cease grazing activities. If any permittees were to retire or sell out they probably would also relinquish their state leases. However, these leases may be then acquired by another permittee. It is unlikely, therefore, that there will be any significant impact on state lands or revenues. Further, the state lease rate also takes into account grazing capacities, stocking use, and market conditions, all of which are difficult to determine 20 years ahead.

f. Social Services

Because of the small number of ranchers and because of their minimal participation in planning for and use of public services, the impact of the proposed action on the need for and delivery of such services in the ES area will be insignificant. Federal, state, county, and other local services, as indicated in Appendix H, will be continued and will expand in direct proportion to the growth of the county, with or without the BLM action. Impacts on specific social services will result from other causes, such as the expansion of urban-area population and its need for expansion of fire protection, water and sewer systems, and related services as cited in the goals and objectives of the survey of Mohave County citizens in 1975.

The public agency which will be most directly affected by the proposed action will be the Bureau of Land Management itself as discussed in subsection 13 below. Furthermore, implementation of the AMPs will require the BLM to enforce regulations more regularly and monitor environmental conditions and land use activities relative to multiple use of public lands in concert with other Federal agencies (primarily NPS) and the State Land and the Game and Fish departments. BLM will probably also be required to be more responsive to local needs in carrying out its multiple-use policies, such as the need to lease public land for the provision of public services to meet the needs of growing communities.

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*Current allowable AUMs on Federal lands are 68.4% of current allowable use.

g. Social Well-being of the Region and the Communities

The implementation of the BLM proposed action will directly affect the small ranching community which will in turn, to a lesser degree, affect the general community. However, given the minimal economic input, interdependence and traditional isolated life-style of the ranchers, any change in the ranchers' fortunes, as discussed in d above, will have only minimal impact on the region's economic well-being and social structure. In sum, the concerns of the ranchers will still be shared by the surrounding communities but the survival of these communities will not be dependent on the ranchers. The rancher will continue to be regarded in a romantic and protective way.

Impact on the Ranchers. Of the 21 permittees in the ES area, those most directly affected by the BLM actions will be the 13 who live on the ranch and the two residing in Kingman. The remainder who live elsewhere are presently semi-detached from day-to-day on-site concerns and the impact on them will be less immediate in a personal sense. The description of impacts below is of a generalized nature and based on discussions with the ranchers. The impacts are expressed as opinions and are not substantiated by statistical analysis, as it is not available, nor is any precedent that would be analogous to the proposed action.

The impacts discussed below stem primarily from implementation of the AMPs by the BLM. The effects of other impacting actions (e.g., range improvements) have a greater significance economically and are discussed in d and e above. The impacts are area-wide.

In the short term, the AMP implementation will cause economic difficulties which may in turn effect some changes in the life-style of the ranchers. Some who are fairly new to ranching in the area may sell out in the face of economic difficulties; others who have a long personal commitment to ranching as a way of life and ties to the local area and community may "hunker down," cut back operations, but stay close to the land and ride out this initial period. This reaction will be translated into a more stringent life-style calling for the reduction of expenditures for personal activities and needs and a greater reliance on self-sufficiency for the basics of life. It is not expected that the conservative values held by the ranchers will change in any significant way. Further, the ranchers will also continue to focus on their own immediate concerns involving the ranch and the family. While some conflicts may become more pronounced, such as increased recreational use of public lands and the use of uncontrolled subdivision lands, they are not expected to be disruptive nor unresolvable.

There may be some dislocation of the ranching community in the short term as a result of the implementation of the AMPs. Some of the smaller ranches existing on a marginal operation (11 of the 18, exclusive of the three ephemeral allotments) may sell out and turn to other livelihood in town. Or, if the issue of self-management becomes emotionally more significant than that of economic well-being, some ranchers may migrate to

and invest in ranchland in other states where there is less public land ownership and regulation. However, as has been indicated by Smith and Martin;

> "The ties to the local area and community held by Arizona ranchers (and as found in the study area) are a conviction of their ranch fundamentalistic and economically satisfying attitudes. Most ranchers feel satisfied to remain in the local area and would be reluctant to relocate elsewhere. Their agricultural and local orientation give rise to immobility almost regardless of the market price of ranches."*

The aggravations and strained relations with the BLM will remain in the short term, particularly when the initial stocking rate is carried out. Implementation of the proposed action will intensify the reluctance or resistance of the ranchers to carry out the water developments and range improvements on their privately-owned lands as the ranchers will probably have difficulties in obtaining loans.

In the long term, the BLM actions will bring some benefits to the ranchers as range conditions improve and the management plans of the ranches are stabilized. As production of the ranch improves in relation to a balance between use and capacity, so too may the ranchers' relationship with BLM improve. It is pointed out that the focus of the rancher is animal production and management, while that of BLM is land management. A greater degree of harmony between both parties may be achieved if and when the objectives of both are reached. Further, any land disposals or consolidations will be welcomed as relief from BLM control. The custodial allotments may benefit the most from these disposals. This is not to imply, however, that there will not be continued differences between the two, as any government presence has been historically viewed with suspicion and considered unnecessary interference.

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*Smith and Martin, "Socioeconomic Behavior of Cattle Ranchers with Implication for Rural Community Development in the West," Arizona Agriculture Experiment Station Journal, Article No. 1897.

13. Institutional

The institutional impacts result primarily from the implementation of the proposed intensive range management plans. The effects as discussed below will be felt by all permittees and the BLM. It will also affect other levels of government, as noted below.

a. BLM Land Management Procedures

As a result of the implementation of the proposed AMPs, the BLM, the area, and district offices will have a more direct and pervasive role in the management of the public lands for livestock grazing and other multiple-use purposes. This has already begun to occur and will continue into the long term. This responsibility will require additional BLM staff positions, as discussed in Chapter I, to determine if management practices and objectives as provided in AMPs are being achieved. Further, BLM will have to determine if the premises upon which the AMPs are developed are appropriate given such factors as the need for better trend data, monitoring programs, changes in the range conditions, and enhancement of other uses of the public lands.

BLM will also be required to make adjustments in its budgetary commitments and resources in order to finance the range improvements as discussed in subsection 12 above or forego the proposed improvement schedule. This is particularly true in light of the present allocation of BLM funds for range improvements for Arizona as a whole, which is only $250,000 annually. This is nearly the estimated cost for the first year's improvements in the ES area as indicated in Table I-10. Moreover, Congress has not to date appropriated additional funds for AMP implementation. The new fee structures as established in the Land and Management Act of 1976 will partially offset the costs as indicated in Chapter II-B12 but not to the full extent of the projected costs.

b. Interagency Agreements

(1) The Soil Conservation Service. It would appear that with an increased management role and the need for additional range and environmental data, the BLM and SCS will strengthen their cooperative linkages. This will be particularly evident in the determination of the appropriate uses of range resources, the quantification of these resources, and acquisition of additional scientific data.

(2) The National Park Service and Other Federal Agencies. It is not expected that the relationship and agreements with NPS will change in any significant manner as a result of the proposed action. While existing exchange classifications will be cancelled or new ones established as the need arises, the basic working agreements are expected to remain operational. Other agencies are not expected to be affected by the proposed action and their roles and services as displayed in Appendix H will remain essentially the same.

(3) The State Land Department. Recently, the State Land Department has embarked upon a broader-based utilization of state lands involving the enhancement of resources. Although the state legislature has indicated it has a strong and continued interest in the economic utilization of state lands, the trend toward establishing and implementing long-range conservation practices points to a more harmonious relationship between the department and the BLM. This improved relationship should lead to a clearer agreement on purposes, management practices, and the determination of grazing capacities. Further, it should lead to realization of land exchange programs to obviate the operational difficulties inherent in the present checkerboard land ownership.

(4) Relationships With Local Government. The relationship with local agencies is not expected to change in either the short or long term. There will, however, continue to be pressures on BLM to be more responsive to local, primarily county, government needs, be they for land or the maintenance of financial revenues. This latter fact will be of particular concern in the short term with the reduction and the potential loss in taxes or personal and property values as discussed in subsection 12.

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# IV. MITIGATING MEASURES

This chapter describes the possible mitigating measures that would reduce or eliminate the adverse impacts of the proposed action as identified in Chapter III. These measures would be taken in addition to the proposed action although they may alter some activities of the action as described in Chapter I. The measures would apply to both public lands and any private or state lands on which an easement is involved. The measures are considered feasible under existing technology and would be applied if the proposed action is implemented. The measures are segregated into six mitigating actions, three monitoring actions, and the identification of three future opportunities for four range management actions.

## A. MITIGATING ACTIONS

### 1. Temporary Protection of Pinyon-Juniper Control Site, Truxton Canyon

Site-specific mitigation is in order on the Truxton Canyon allotment where 705 acres of pinyon-juniper are scheduled for chaining and seeding. Under the present AMP, this allotment will be under a deferred grazing system (Chapter I). Since this grazing system does not allow for an extended period of rest (one year or more), it will have to be varied at the time of this action to allow for protection of the seeded site for a minimum of two growing seasons to assure for the opportunity for seedling establishment.*

Protection of the site to be improved can be accomplished by constructing 6.2 miles of fence around the 705 acres. At a cost of $2,500 per mile, this would be $15,500, an excessive expenditure. A preferred method would be to deny livestock use to the total pasture for two growing seasons by utilizing present pasture fencing. This would necessitate running livestock numbers scheduled to use the to-be-improved pasture, in other pastures for an additional several month period. For this brief period, it would not be expected to reduce current AUMs. The impacts of additional numbers in the use pasture would have some minimal, short-term adverse impacts.

### 2. Livestock Management Through Control of Waters

A key range improvement ingredient that is essential to the introduction of the proposed grazing systems is the capability of controlling livestock. This is proposed to be done within AMPs by the construction of 147 miles of Type A fence line to be built on BLM and private land at a per mile cost of $2,500 for a total of $367,500 (Table I-10).

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*Guide to Improvement of Arizona Rangeland.

A mitigation measure that can be used in the initial implementation stages would be to fence or trap the water use site using trigger gates as the means of gradually shutting off access to the waters. In this manner, livestock control is accomplished by closing off access to water when the grazing area adjacent to the water has reached a predetermined use level. At that time, the livestock would be moved to an area with accessible waters. A complementary benefit of water traps with triggers adjacent is that they can be set at the discretion of the ranch manager to assist in gathering livestock for inspection, treatment, or sale.

The intent of this mitigating measure is to initially reduce the economic impact of fence construction in the magnitude that is projected. In those instances on seven allotments (as shown in Table IV-1) where the basic management objectives of the grazing systems as planned in the AMPs can be basically achieved by water control in deference to several miles of fence, the improvement cost is substantially reduced.

This alternative measure for achieving livestock control in some instances may be inadequate to achieve management goals; hence it becomes a less expensive option to phase into a pasture fencing program as budgets permit. In other instances, all of the management goals may be achieved in this manner. Each allotment improvement plan would have to be critically reviewed to determine the practicality of substituting water-site traps for extensive fence lines.

This mitigating action would not require a restudy of the proposed grazing systems. However, implementation should be carefully planned relative to existing and new water sources, location of proposed pastures, and size of herd. Not all present, nor proposed water sites would necessarily be fenced and trapped. In designing water traps, wildlife considerations would be guaranteed. That is, wildlife would at no time be denied use of water.

The effect of this mitigating action would be to reduce the initial capital outlay for fencing by $85,500; reduce at least temporarily and in some instances permanently the amount of interior fencing on some allotments; reduce the impacts of construction and trail extension for 49 miles of fence (see Chapter III-B3 and B-9); and the reduction of some visual impacts associated with 49 miles of fence (see Chapter III-B11). When fencing is intended for other purposes such as separation of ownership patterns or for specific uses, the concept of substituting water traps for division fences would not apply.

3. Burro Control Program

Before implementation of the proposed ES area grazing systems, approximately 1480 burros must be removed from ES area rangelands in order to achieve the burro population objectives of the AMPs. Further, the competition for limited forage resources for cattle and burros will

TABLE IV-1

SAVINGS ACCRUING FROM WATER TRAP SUBSTITUTION FOR DIVISION FENCING
SEVEN ALLOTMENTS – ES AREA

| Allotment Name and Number | | Water Traps (@ 0.125 mile per trap) | | | Fence Line | | Savings @ $2,500 per Mile |
|---|---|---|---|---|---|---|---|
| | | Number | Miles | Cost | Miles | Cost | |
| Black Mountain | 10A | 15 | 1.875 | $ 4,700 | 14.0 | $ 35,000 | $ 30,300 |
| Cane Springs | 15A | 11 | 1.375 | 3,400 | 3.5 | 8,800 | 5,400 |
| Cerbat/Quail Springs/ Turkey Track | 20A | 8 | 1.0 | 2,500 | 3.5 | 8,800 | 6,300 |
| Dolan Springs | 30A | 12 | 1.5 | 3,800 | 7.5 | 18,800 | 15,000 |
| Gediondia | 36A | 21 | 2.625 | 6,600 | 10.0 | 25,000 | 18,400 |
| Mineral Park | 55A | 10 | 1.25 | 3,100 | 3.0 | 7,500 | 4,400 |
| Stockton Hill | 66A | 4 | 0.5 | 1,300 | 2.8 | 7,000 | 5,700 |
| Totals | | 81 | 10.125 | $25,400 | 44.3 | $110,900 | $85,500 |

**Note:** This table is representative of the ES area. Close scrutiny of each allotment improvement plan could well add to or delete from this preliminary listing.

**Sources:** Arthur D. Little, Inc., estimates; Figure I-4 and Table I-10.

be reduced and the potential deterioration of range will be averted. It is also assumed that an additional 200 animals will be restricted to the Black Mountain wildlife reserve, located in the extreme southern reaches of the ES area.

According to the BLM implementation schedule (Table I-10) the burro removal programs must be completed by 1980 for the Fort McEwen and Gediondia allotments, by 1982 for the Black Mountain and Big Ranch allotments, and by 1983 for the Silver Creek, Thumb Butte, and Portland Spring allotments. Otherwise, a delay in AMP implementation will occur or allotment stocking levels (where applicable) will be reduced.

The actual completion date for ES area burro removal programs will depend upon Federal funding (other than range improvement) and available manpower. In the past, 600 burros were removed from similar rangelands within four months at approximately $200/head*. It is estimated that the control program will require a 10-month effort with seven to eight personnel spread over four years at a cost of $290,000. These figures, however, do not take into account a 10-30% annual recruitment rate in the burro population. This expected cost of removal may be 10-30% higher before the program is completed. The program will be managed similarly to other BLM projects and guidelines and is not expected to generate any adverse impacts.

4. Financial Assistance for Construction of Improvements

As discussed in Chapter III-B12, the 20 livestock operators who incur a cost of $322,500 for improvements on private land will not be in a favorable position to absorb this as their returns under the initial stocking rate will barely cover O&M costs. At the risk of not having any improvements on private lands, the BLM proposes to assume this cost and reduce the impact upon the allottee. This action will also assure that these improvements will be constructed and that acceptable environmental standards will be met. Furthermore, it will allow for cultural, visual, and threatened and endangered plant and animal clearances as noted in Chapter I.

The BLM will implement this action as described in Chapter I for the proposed improvements on public lands in the schedule as shown in Table I-10. The BLM will also obtain easements on private and state lands to locate and install all proposed improvements. These cooperative easements will be obtained at no cost as has been done in similar situations elsewhere with public lands. The direct cost to the BLM will be $322,500 for labor and materials, while the estimated maintenance cost of $8,200 annually will still be absorbed by the ranch operator. Construction impacts will be as discussed in Chapter III, all environmental elements, under range improvements and water developments.

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*Bureau of Land Management, Alamo, Arizona Habitat Area, 1977.

5. Establish Communication Programs

As discussed under Socioeconomic Conditions in Chapters II-B12 and III-B12, the relationship of the rancher with the BLM is strained. The BLM is perceived as "taking over" and mandating the future of the livestock industry in Mohave County. This opinion of too much government control is also reflected in the attitudes of the communities in the area. To a certain extent these perceptions are fostered by a lack of communication between the permittees and the BLM. The purposes, responsibilities, and concerns of both parties are misunderstood and the recipients of the proposed action feel threatened.

As a means of alleviating these types of impacts on the social well-being of the area's inhabitants and permittees, it is proposed that an educational program be developed by the BLM. The purpose of this program would be to increase communication and understanding as a means of fostering appropriate range and resource management practices. The program could be established in conjunction with other public and private agencies and institutions such as the SCS, the NPS, the University Cooperative Extension Service, the State Land Department, the State Game and Fish Department, the Natural Resource Conservation District, the Society for Range Management, the Arizona Cattle Growers' Association, the Arizona Wildlife Federation, the Arizona Academy of Science, and the Mohave Livestock Association. The expertise and the publications of these and other environmental, cultural, scientific, and business associations can be used as a basis for the following activities:

- Publishing newspaper articles on BLM planning and management policies and practices.

- Disseminating regionally-oriented publications and papers to all permittees as well as to the BLM offices and libraries.

- Establishing information seminars, of one or two days' duration, regarding:

    - Animal husbandry and ranch management practices. This would be particularly valuable in assisting the rancher to realize the opportunity of an 85% calf crop in conjunction with improved range conditions as discussed in Chapters II-B12 III-B12.

    - Range and wildlife conservation techniques.

    - Marketing information.

    - Environmental legislation.

    - The findings of the monitoring programs described below.

- Educating the public to cultural resource values and to the damage done by thoughtless collecting of artifacts. This might decrease the rates of inadvertent destruction of archaeological sites. The BLM could reserve some archaeological sites, such as rock art panels, plant processing sites, etc., as visitor recreational/ educational sites and provide interpretive material to increase public understanding of the ways in which people used their environment. Roadside scenic markers which emphasize human history as well as environmental settings could also serve as a vehicle for educating visitors about cultural resource values and the legal and ethical restraints on unregulated collecting.

  Moreover, the BLM could make available to local institutions, such as the Mohave Pioneer's Historical Museum and the Mohave Community College, materials, information, and expertise that would assist them in preparing exhibits about historic and prehistoric cultural resources. Establishment of a chapter of the Arizona Archaeological Society and of courses in local prehistory and archaeology at Mohave Community College, while outside the scope of the BLM's responsibility, would help establish legitimate outlets for the public's desire to participate in archaeological endeavors.

- Increasing the availability of local range information by disseminating all allotment site survey data and the associated use implications to each permittee.

- Informing the allottees of all available public resources for range improvements such as provided by the SCS and others.

- Extending the BLM's direct contacts with the allottees by more frequent site visits and observation of range conditions, problems, and management practices.

The duration of the efforts should extend through the initial implementation period of the AMPs and include the construction period. The estimated annual cost of this five-year program starting in 1978 is $35,000. It is based on 20% time commitment of three to four BLM personnel, or one full-time equivalent, per year at $20,000, plus overhead expenses and fees for any outside seminar speakers. The above proposed activities should be conducted in the Kingman area and focus on Mohave County in general and 21 permittees in particular.

It is noted that this mitigation measure will not directly alter a quantifiable adverse impact. Its primary purpose is directed toward attitudes, perceptions, and interrelationships and cannot be measured. The trade-off can best be described as one of continued antagonism versus an environment of cooperation.

The impacts of this action are mostly beneficial provided a meaningful and consistent commitment is made by the BLM. The financial and institutional effects on BLM as noted above, and no other significant impacts, are anticipated.

6. Cultural Resources

a. Grazing and Range Improvements

The major impacts of grazing on cultural resources (Chapter III-B9) result from trampling of artifacts and from locally heavy erosion around livestock concentration points, such as at water sources. In conjunction with the cultural resource clearance required before construction, it is proposed that an area of approximately 125 yards' radius around the improvement be free of cultural resources.

Cultural resources affected by the trails used for the construction of range improvements and water developments can be protected by locating these trails in stream beds and on bedrock to protect resources occurring on stream terraces. No adverse impacts are foreseen with these two actions.

b. Vandalism

The reduction of the adverse impacts of vandalism may be achieved through patrolling, educational programs, and obtaining allottee cooperation in the preservation of cultural resources. The BLM could initiate regular, publicized, and unscheduled patrols to areas known to have high rates of illegal collecting and vandalism such as the mining camps, ghost towns, and prehistoric sites in the Black Mountain passes. A precedent for this type of action has been established in the Grand Gulch Primitive Area of southeastern Utah which is regularly patrolled and protected by BLM rangers. It is estimated that such patrols would result in a cost of $2,400 annually to the BLM at the rate of one a month.

B. MONITORING ACTIONS

1. Wildlife and Range Conditions

For a specific resource area, the development, initiation, and sustained implementation of a proper grazing system must be founded on an understanding of the interactions between livestock grazing, range production potential,

vegetative condition and trend, and wildlife populations. Essential to this understanding is a continuing program of inventory and subsequent monitoring of:

- The existence and locations of critical habitats,
- The existing and/or natural distribution and abundance of wildlife populations and plant communities including threatened and endangered and poisonous plant species,
- Present and potential range herbage and forage production,
- Both short- and long-term climatic conditions, and
- The relative effects (both beneficial and adverse) of proposed grazing systems.

Although BLM data files contain extensive information on certain aspects of the biotic resources and productivity of the area, some data are limited in completeness. This is particularly true in regard to the assessment of range production potential and the determination of the existing and natural distribution of wildlife populations. This situation is noted in Chapter II-B5 and II-B6 for all species other than the big game and horses and burros. Practically no information on animals or range condition exists relative to the eight custodial and three ephemeral allotments.

Information relating to the distribution and abundance of threatened and endangered and poisonous plants of the area is also limited. This is recognized in Chapter II-B5 and in Chapter III-B5. Similarly, areas having a high potential for being classified as crucial habitats (e.g., riparian and spring sites) have not been adequately surveyed. Without a more complete inventory of these plants and animal environments, the assessment of impacts on vegetation and animals cannot be complete, as noted in Chapter III-B5 and B6.

It is noted that the BLM in Chapter I, under Evaluation, has proposed studies to evaluate and adjust the AMPs relative to actual range use, utilization, trend and condition, habitat trend, and climate analysis. Permanent trend plots will be established in key areas before AMP implementation. The additional inventory and monitoring actions that can be undertaken by the BLM on these plots are:

- The design and operation of a monitoring program to provide information on forage utilization diversity and density of all important herbivores other than big game species on a seasonal basis, including small mammals, birds, amphibians, and reptiles.

- A program to inventory and monitor the distribution, phenology, and abundance of threatened and endangered plants as listed in Table II- 14 and discussed in Chapter II-B5. This would be applied to the nine different grazing system allotments, the three ephemeral allotments, and the Valentine, Cook Canyon, Feldspar, and Jones Spring custodial allotments.

- An inventory and monitoring program of the riparian habitats. There are approximately 250 riparian and/or spring sites within the ES area. The available BLM data do not adequately describe the biotic resources and the extent of livestock impact on those resources for each of the spring and riparian types. An analysis of the presence of critical riparian and spring areas and the management measures necessary to guarantee the resource integrity must await further site investigations. Essential information needed for each riparian and/or spring site includes:

  - Degree of area utilization by wildlife species,

  - Site classification by vegetative type and description,

  - Presence of unique and/or endemic, threatened, and endangered species (with particular emphasis on any warm spring sites), and

  - Influence of livestock grazing on the natural environmental elements.

The responsibility for designing and implementing the inventory and monitoring programs as described above must be borne by the management agency responsible for the grazing program that is, the BLM. However, both state (State Land Department, Arizona Game and Fish Department) and Federal (U.S. Fish and Wildlife Service and Soil Conservation Service) agencies have vested interests in various aspects of the identified data needs. Coordination and cooperation with these agencies therefore is critical and the design and administration of any monitoring program should include inputs from the appropriate agency or private associations as may be necessary.

The impact of these programs will be primarily financial. The threatened and endangered plant and riparian monitoring programs can be an extension of the BLM range monitoring programs described in Chapter I, but are estimated to require the services of a range technician for a six-month period at $5,000 for the initial inventory. Subsequent costs of monitoring will be included as part of the proposed BLM programs.

2. Obtain Additional Toxic Plant Information

In order to obtain long-term information that will provide input to range and grazing management decisions that prevent or reduce potential plant poisoning, case history information by incident needs to be accumulated.

This can be done through a poison plant questionnaire made available on a continuing basis to all allottees. This questionnaire would be designed to seek the following information: specific plant identification, cause of death or chronic toxicity, animal symptoms as observed, season of occurrence (date), climatic conditions under which problem occurred (drought, dramatic change in temperature, plant stress such as wilt, etc.), class and condition of livestock affected, livestock history (local cattle or imported; if so, from where), frequency of problem occurrence, and specific location of each poisoning incident, etc.

The responsibility for this action would be with the BLM. It is estimated that this activity would cost approximately $1,200 per year and should be conducted annually. It should also be coordinated with any site specific information obtained from the range surveys.

3. Cultural Resources Monitoring

The impacts of trampling may be analyzed using the BLM exclosures (control areas) discussed in Chapter I. Either naturally-occurring sites or artificial distributions of artifacts may be used to measure the differences in artifact breakage and displacement between grazed and ungrazed areas, both of which are, in addition, subject to natural processes of erosion, etc. The essential components of determining the grazing impacts are:

- The set of exclosures and impact areas,
- A set of artifacts similar in type and material to those commonly found in the ES area and sufficient in number to product statistically meaningful results,
- Complete documentation of the placement and condition of artifacts in both control and test areas at initiation,
- Measurement of artifact breakage, displacement, and loss in control and test areas at regular intervals over a substantial period of time, and
- Control of cattle use (length of pasturage, weight, or number of head) and of distance of test plot from watering station or other concentration point.

## C. FUTURE OPPORTUNITIES

On the basis of additional resource information that will be collected over time through the monitoring actions proposed above and in Chapter I, new opportunities to manage the range will become apparent. The following are actions the BLM cannot commit to at this time but will as the opportunity arises on a site-specific basis.

### 1. Develop Range Improvement Potential Through Additional Vegetative Manipulation on Selected Sites

The primary criterion for judiciously selecting additional sites would be soil associations possessing at least a medium potential for range improvement. The sites would also have to possess other characteristics that would permit mechanical and/or biological (fire) control methods and reseeding as improvement tools.

Those allotments within the ES area that possess reasonable acreages of soil associations 10, 11, and 12 (those having medium potential for range revegetation, Table II-11, include Hackberry, Mineral Park, Music Mountain, Mt. Tipton, Pine Springs, Stockton Hill, Truxton Canyon, Upper Music, Cane Springs, Canyon Ranch, Cedar Canyon, Cerbat/Quail Springs/ Turkey Track, Clay Springs, Crozier Canyon, Diamond Bar/Gold Basin, and Dolan Springs. The fact that these allotments possess these soils does not mean that they have the other characteristics such as position, depth of soil, topography, accessibility, precipitation, etc., that are conducive to vegetation modification and the introduction of such other water conservation practices as diking, water spreading, and pitting.

Initial selection of candidate areas for vegetation modification can be done on the basis of remote sensing data now available from Earthsat, Landsat, and U-2 flight sources. Following initial site selection via the orthoguad, color, and color infrared photography, on-site visits will permit specific site selection that considers all characteristics necessary before making decisions relative to what can be done where. On-site data derived from long-term monitoring will permit specific site selection.

Sites to be selected should be a minimum of one section in order to equitably have a unit of a size that can blend in as a management unit or a major portion thereof.

The costs relative to implementing mechanical control would be equivalent to current estimates for such actions on Truxton Canyon ($16 per acre) and on Mt. Tipton ($8 per acre).

As such actions might be implemented, there would be a feed denial period of a minimum of two growing seasons or approximately 18 months to allow for seedling establishment. For this brief period, it would not be anticipated to reduce current AUMs unless the area to be improved was

extensive and would take up an appreciable acreage of the use area. Also, as is indicated within AMPs, range improvements are intended to be done during rest or deferral periods of the specific pastures.

Impacts of such mechanical and biological control and seeding practices are covered in Chapter III-B5.

Through proper treatment and seeding, a change in vegetation composition could be achieved that would benefit both wildlife and livestock grazing.

Another potential action that would enhance the productivity and the usability of the mountain portion of the Upper Music allotment would be the introduction of a controlled burn through the area that was chained and seeded in 1963. Under present management, this area has not been grazed since 1975. It is presently recovering even under the apparent dry period that has impacted the area. At present, a grass fuel base is building up in this pasture; in the near future it would be conducive to carrying a fire that would clean up the fairly extensive pinyon-juniper debris. Such a fire would also kill the young pinyon-juniper plants that are now appearing in the area. A controlled burn would not have debilitating effects upon the established grass species.

2. Reclassification of Selected Allotments to Ephemeral Range Type

The BLM, following proposed monitoring actions that establish actual trend and forage production data over a several-year period, could consider reclassifying additional allotments entirely or partially as ephemeral.

On the basis of site observations and limited availability of vegetation for collection (Table II-10 ) on portions of the Ft. McEwen and Gediondia allotments, it would appear that portions of these allotments more closely conform to an ephemeral designation rather than their current perennial classification. The primary purpose of this action would be to protect the existing perennial vegetation as the apparent forage production is low. Furthermore, the current designation does not appear to reflect the actual environment or condition of the range.

Such a change in designation in all or portions of these allotments would have a significant impact on the allottees as there would be a withdrawal of cyls relative to the areas designated ephemeral. Assuming all cyls were to be removed at an inventory value of $223 per cyl, the estimated value loss to Gediondia* would be $20,090 and $31,220 for Ft. McEwen.** The value of the ranches would also be reduced by $22,900 and $35,600, respectively, at a value of $254 per cyl.

Under an ephemeral designation, it is assumed that no new improvements would be required except for one spring development by BLM on each allotment for wildlife purposes. This would be a reduction of $42,600 in BLM costs and $20,350 in private costs for Gediondia and $22,500 and $25,000, respectively, for Ft. McEwen.

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*90 cyls at initial stocking rate.

**140 cyls, exclusive of custodial stocking rate.

Future stocking of such ephemerally designated ranges would then be on the basis of annual forage available seasonally and would be managed in accordance with the ephemerally designated ranges within the ES area.

3. Wildlife Management of Selected Crucial Habitat Areas

If the 1480 burros cannot be removed within one to two years, protective measures for crucial wildlife habitat must be undertaken because of the burros' high reproductive rates and forage consumption levels. This will adversely affect the habitat areas and livestock grazing activities as well.

The purpose of this proposed action is therefore to enhance and protect approximately 99,040 acres of crucial wildlife habitat as identified in Chapter II-B6. Each primitive wildlife area would be fenced to permanently exclude the burros. Under such conditions, plant succession would progress towards a more "natural" state, which is expected to provide native wildlife with optimum habitat reserves. Eventually, these protected regions could serve as baseline habitat references for comparative analysis with grazed pastures. Information concerning specific locations (by allotment) and estimated financial implications and livestock exclusion for the selected wildlife areas is presented in Table IV-2, and Figure IV-1.

4. Stabilization of the Livestock Economy

The basic premise of this future measure is to offer a dramatic opportunity to stabilize the livestock economy within the ES area and at the same time allow for the greatest opportunity to improve the rangeland (public and private) within the shortest time frame.

This measure is based upon the concept of developing possibly two irrigated feed production centers, one in the Hualapai Valley, the other in the Sacramento Valley, to provide a continuing feed source that could supplement and complement the range livestock industry within the ES area. A projected size of each center would be approximately 1000 acres under irrigation.

As it would be presumed that such a cooperative developmental effort would occur on deeded lands, this measure would be one of choice by the rancher community with conceptual support from the BLM.

The options for developmental procedure are open. It would take the combined effort of an existent organization (e.g., Mohave Livestock Association) or an organization to be formed, to arrange for long-term low interest rate funding for land purchase, development, operation, and maintenance of such forage production centers. Once developed, the forage production centers would run on a self-pay-back basis. Revenue generated from feedstuff sales to co-op members would be scaled in relation to mortgage, interest, and operation and maintenance requirements. The feed

## TABLE IV-2

### SUMMARY OF PHYSICAL PARAMETERS AND APPROXIMATE FINANCIAL IMPLICATIONS OF THE IMPLEMENTATION OF RECOMMENDED PRIMITIVE WILDLIFE AREAS

| Wildlife Primitive Area | Total Acreage | Total Required Fencing (miles) | Recommended Water Developments | | Existing Water Sources | | Identified Bighorn Lambing Grounds | Allotments | Grazing Land Reductions (acres) | Reduction in Allotment Stocking Levels | Present Wildlife Primitive Area Land Ownership (acres) | | Decrease in Allotment Herd Value* | Total Cost of Project |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Warm Springs | 45,120 | 60 | Bighorn and Mule Deer | 6 | Permanent | 2 | 1 | Silver Creek | 600 | Ephemeral | Federal | 600 | Unknown | |
| | | | | | Seasonal | 4 | | | | | State | – | | |
| | | | | | | | | | | | Private | – | | |
| | | | Small and Nongame | 2 | | | | Black Mountains | 7,000 | 16 cyl | Federal | 7,000 | $3,568 | |
| | | | | | | | | | | | State | – | | |
| | | | | | | | | | | | Private | – | | |
| | | | | | | | | | | | | | | $159,200 |
| Mt. Nutt | 15,680 | 25 | Bighorn and Mule Deer | 5 | Permanent | 2 | 1 | Silver Creek | 4,980 | Ephemeral | Federal | 4,345 | Unknown | |
| | | | | | Seasonal | 7 | | | | | State | 210 | | |
| | | | | | | | | | | | Private | 425 | | |
| | | | Small and Nongame | 2 | | | | Black Mountains | 10,700 | 21 cyl | Federal | 10,700 | $4,683 | |
| | | | | | | | | | | | State | – | | |
| | | | | | | | | | | | Private | – | | |
| | | | | | | | | | | | | | | 72,300 |
| Burns Springs | 17,280 | 33 | Bighorn and Mule Deer | 3 | Permanent | 0 | 1 | Ft. McEwen | 12,160 | Ephemeral | Federal | 12,080 | Unknown | |
| | | | | | Seasonal | 8 | | | | | State | – | | |
| | | | | | | | | | | | Private | 80 | | |
| | | | Small and Nongame | 0 | | | | Gediondia | 5,120 | 12 cyl | Federal | 2,560 | $2,676 | |
| | | | | | | | | | | | State | – | | |
| | | | | | | | | | | | Private | 2,560 | | |
| | | | | | | | | | | | | | | 87,300 |
| Mt. Perkins | 20,960 | 30 | Bighorn and Mule Deer | 1 | Permanent | 0 | 1 | Big Ranch | 20,960 | Ephemeral | Federal | 12,000 | Unknown | |
| | | | | | Seasonal | 1 | | | | | State | – | | |
| | | | | | | | | | | | Private | 8,960 | | |
| | | | Small and Nongame | 0 | | | | | | | | | | 75,700 |
| | | | | | | | | | | | | | | $394,500 |

*$223/cyl.

**Source:** Arthur D. Little, Inc., estimates.

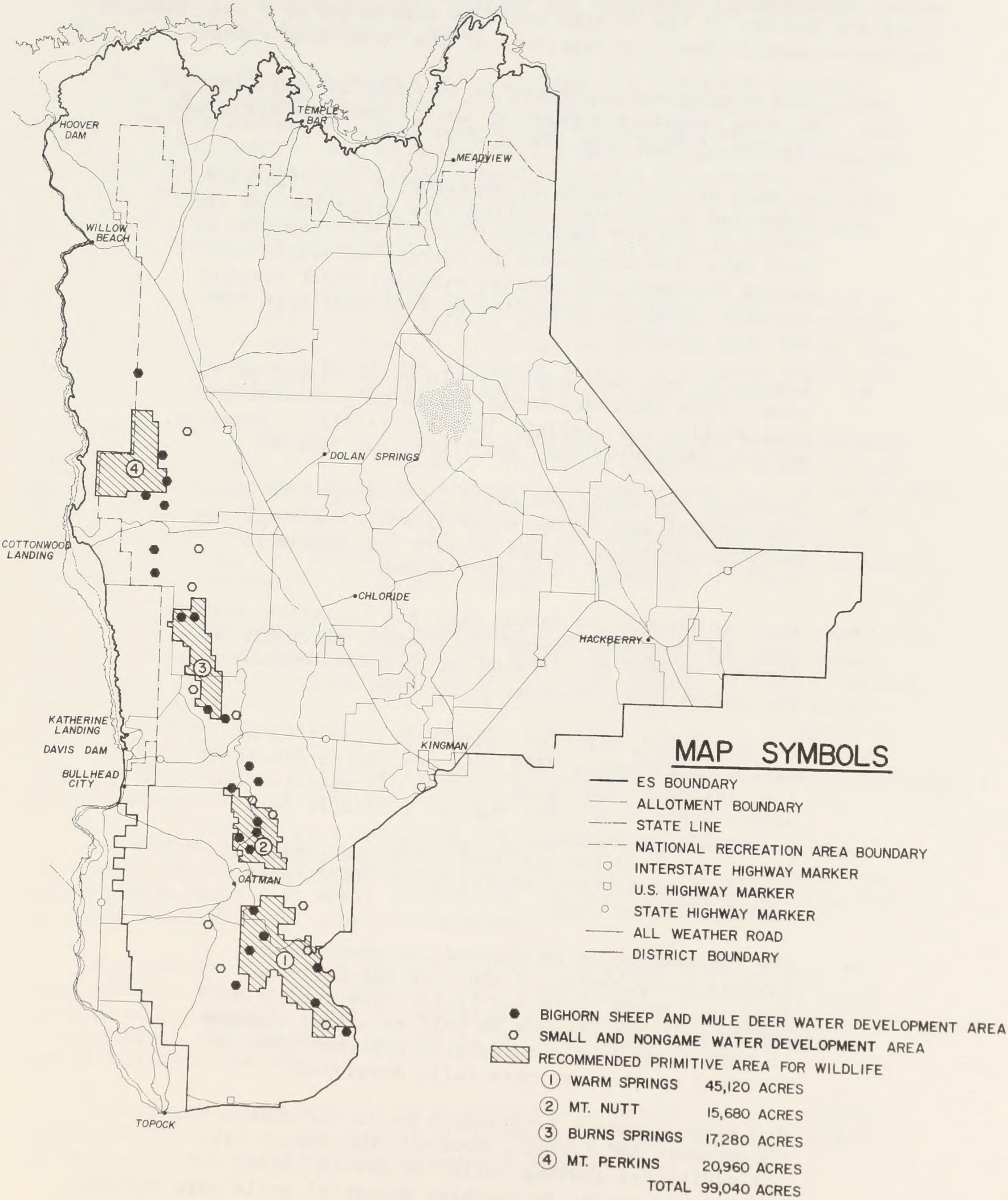


FIGURE IV-1 CRITICAL HABITAT AREAS

center development, operation and maintenance, and role in stabilizing the livestock economy of the ES area would be determined by a duly elected and representative board of directors of the co-op feed centers.

- This developmental concept is designed to stabilize the ES area livestock numbers at the present allowable use figures of 7623 cyls (Table I-3).

- It will provide feedstuff opportunity for allottees scheduled to receive stocking rate reductions as the result of the AMP implementations. The reduction of 1603 cyls (the difference in current allowable use, entire allotment, and initial stocking under grazing systems) would be satisfied by feed available from the feed centers.

- Logically, one feed center would be developed at a time. Site selection would depend on groundwater availability and quality, land availability, location, service considerations, and logistical support.

- Feedstuff fee schedules would be developed to meet the variable rancher needs as livestock numbers are withdrawn from public and private rangelands in order to encourage their improvement.

- It is reasonable to assume that the livestock numbers could be increased beyond the present allowable use figures of 7623 cyls following full development of the second 1000 acre-feet production center.

- In the future, with the rangelands producing an estimated potential 7054 cyls (estimated potential for grazing systems plus initial of custodial use areas, Table I-3) and the two 1000-acre feed centers fully developed and producing feed equivalents for an additional 3000 cyls, the potential livestock production capability of the ES area would be 10,054 cyls.

- The implementation of planned improvements and grazing practices would continue basically as planned, though there may be the opportunity of making priority changes as well as actual changes in some plans as the integrated opportunities of the feed centers are more fully developed.

- BLM range resource involvement would not change from the present AMP format. However, the opportunity for additional grazing relief on public lands, which could assist in reaching potential goals more rapidly, could present itself on a voluntary basis from individual allottees.

Because this action would be one of choice by the rancher community and in addition to the pending action, all facets of the pending action remain in force. This means that impacts and relationships relative to Chapters II and III continue to apply.

The intent of this proposal is to provide the livestock industry within the ES area with an innovative opportunity to initially stabilize their livestock numbers at present levels of current allowable use. With the full development of one 1000-acre feed production center, the numbers scheduled for reduction, 1603 cyls, could basically be provided for by feed produced at that center. Forage production from the irrigated feed centers will in essence carry 1.5 cyls per acre; hence, each 1000-acre unit can provide feed opportunity for 1500 cyls on an average.

With the two feed production centers fully operable, there would be an opportunity for allottees to relieve grazing pressure on their native rangelands (public and private) by shifting livestock numbers to the feed centers. It would be a voluntary livestock reduction program beyond the numbers now scheduled for reduction under the proposed action.

Before the institution of this alternative, a rancher organizational structure would have to be developed. The group would then solicit long-term, low-interest rate financing through an organization such as the Farmers Home Administration. With such financial support, the co-op group could enlist resource assistance from the SCS and the Agricultural Extension Service, University of Arizona, to enter into a detailed study to determine the agronomic feasibility of such a concept.

Such a study would include candidate site selection of 1000-acre units in the Hualapai and Sacramento valleys, as noted above, and groundwater review to determine quantity and quality of water available. Alternatives for pumping energy sources would be assessed. Irrigation method alternatives (flood versus sprinkler) would be explored in relation to soils of the candidate sites, water quality, efficiency in application, and plant consumptive use needs. Irrigation methodology would hinge upon the economics of land preparation in relation to the water application.

A structural format for designed use of the feed center services and facilities by co-op rancher members would have to be formulated upon an equitable basis that would provide for the opportunity of each member to avail himself of the center's services.

Motivational goals and educational efforts would be developed cooperatively with as many governmental, educational, and private institutions as possible in order to maximize the opportunities of such centers to complement the rangeland operations and supplement the livestock industry within the area.

Additional comments would be speculative in nature, as the primary intent at this time is to present an innovative alternative that would be by choice and would receive conceptual support from the BLM.

# V. ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

The unavoidable impacts analyzed in this chapter are those impacts which were identified in Chapter III and were unmitigated or only partially mitigated in Chapter IV.

## ANALYSIS

### 1. Air Quality

Although the implementation of the AMPs will result in a decrease of particulate emissions by about 6%, there will still be 10 days when the state annual standard is exceeded for the ES area. The project contributes about 40% of this total amount. This effect will continue to occur throughout the long term. Most of these emissions are generated in the valley areas containing all or portions of 13 allotments. In the short term the construction burning and chaining actions will cause 6500 tons of particulate emissions in the vicinity of two allotments. These emissions will be mostly localized at the point of activity and occur over a brief period of time.

### 2. Geology and Topography

The proposed action has no identifiable adverse impacts on this environmental component.

### 3. Soils

There will continue to be a sediment loss of 612.2 acre-feet annually even with the proposed action, although this is less than at present. The highest yields will occur in the 13 allotments in the valleys composed primarily of three soil associations. The custodial allotments are expected to have a continually higher yield as their ground cover is not expected to improve.

The construction of the water developments and the range improvements will also result in a short-term loss of 0.04 Aft/yr during the construction period. Similarly, the sediment yield for the 705 acres to be drained will be about 0.31 Aft and 0.93 Aft for the 1920 acres to be burned.

### 4. Water Resources

The proposed action has no identifiable adverse impacts on this environmental component.

5. Vegetation

Continued custodial management of eight allotments is expected to result in a deteriorating range condition. Although this trend cannot be quantified at this time due to a lack of site-specific data, the observed condition of fair to poor under such management cannot be expected to improve. Furthermore, vegetal condition on the three allotments where livestock numbers are not controlled on the custodial portions (Castle Rock, Canyon Ranch, and Ft. McEwen), as well as those portions of Black Mountain, Castle Rock, and Canyon Ranch with unfenced custodial lands, will not improve.

Continued damage to the threatened and endangered plants is expected but not quantifiable until the inventory and monitoring actions are established and data collected. This will be particularly true of the three ephemeral ranges where there is a high probability for such plants to exist.

There will also be an initial and small disruption of riparian habitats during construction. These habitats will also continue to be impacted to an unknown extent until site specific analyses are undertaken and protective measures established.

6. Animals

The construction of additional fences in the ES areas will result in the restriction of movement of large herbivores until they learn to negotiate them. Further, the potential for death or injury through entanglement for some ungulates, particularly desert bighorn, will be increased.

The unquantified impacts on animals in the eight custodial allotments and other custodial lands will continue and be adverse as the range condition trend appears to be downward and no new water source developments are proposed.

A short-term disturbance of wildlife habitats from vegetative manipulations will occur. Similarly, some spring riparian habitats will be disturbed by the proposed horizontal well developments. Although threatened and endangered and habitat clearances will be conducted in these areas before construction, this disruption will occur on a localized short-term basis until revegetation and range improvement occurs. The extent of this temporary adverse impact will depend upon the clearance inventory of the riparian areas and cannot be defined at this time. Further, the long-term protection of such areas will depend on the area to be fenced beyond the spring box as determined by specific site investigations.

The livestock/animal competition will continue to be adverse in the short term until the rotation pastures are established. Although the reduction in cyls, the annual survey of range conditions, and the 60% grazing use factor will be in force, the adjustment period will be one of imbalance. This will be particularly true of those habitat areas defined as crucial (Chapter II-B6) and shown in Figure IV-1.

7. Land Use

The proposed action has no identifiable adverse impacts on this environmental component.

8. Natural Hazards

The potential for fires will be increased throughout the area as the vegetation cover and litter improves. Past history indicates that these fires will continue to occur mostly along I-40 and Route 66 and be set by passing motorists.

The dust storm and flood hazards, while reduced by the increased range cover, will still occur. The Hualapai Valley/Red Lake area will continue to be the principal dust storm center. Similarly, the Truxton Wash will also present the greatest flood potential.

9. Cultural Resources

The damage to cultural resources through trampling will continue, although less intensively than in the past. This will mostly occur in the eight AMP allotments having a high sensitivity rating: Big Ranch, Cane Springs, CQT, Grozier Canyon, Diamond Bar/Gold Basin, Ft. McEwen, Gediondia, and Upper Music.

10. Natural Environmental Areas

The potential for loss of the Black Mountain areas having natural, primitive, and wilderness values is apparent although the specific verification is lacking. This location is also an area of crucial animal habitat. The two most critical areas appear to be Willow Springs and Mt. Nutt which are located in allotments with downward trends. Even though these natural areas are generally at higher elevations less accessible to cattle and the cyls will be reduced, the resource is vulnerable until it can be properly evaluated and protected.

11. Visual Resources

There will be some unavoidable small-scale visual disruption of localized areas during construction. The 14 water catchments and dirt reservoirs will be the most noticeable when the earth is excavated (See Table II-57 for location). These excavations are two acres in size and are remotely located. The burning and chaining areas will be more noticeable and for up to two years until growth takes hold. These impacts will diminish in the long term, however, and will not change the VRM classification or scenic quality.

12. Socioeconomic

The initial reduction in the stocking rate to 6020 cyls will result in an unavoidable impact on the 18 permittees as the value of cattle will decrease from $301,200 to $237,800. The value will eventually rise to $303,300 in the long term for a net gain of $2,100. While the total value of the ranches in the long term will be approximately equal to the current value of $7.62 million, the initial stocking rate value will decline to $6.45 million. This will be partially offset by a capital gain of $444,000 from the herd sales. The additional maintenance costs associated with the proposed improvements will amount to $8,200 annually for 23 allotments.

The initial stocking rate will result in an unavoidable loss of direct employment of eight jobs in ranching and a total reduction of 10-12 in direct/indirect jobs. In the long term this will be offset by an increase in five direct jobs and 7-8 jobs total for a net loss of three jobs in ranching and 3-4 jobs totally in the ES area.

The impact on the social well-being of the range community from their viewpoint will be considered adverse. There will continue to be feelings of resentment about government interference in the use of the resource, and that rights to unlimited use have been abused. Coupled with this will be doubts about the wisdom of the proposed action, although the cooperative programs (see Chapter IV-A) hold the possibility of overcoming some of these attitudes.

13. Institutional

The implementation of the AMPs will bring issues and concerns among governmental agencies more to the forefront. While this may not be considered adverse, there will be periods of frustration and adjustment that cannot be avoided. Until some issues are resolved, the proposed program can appear to be threatening and disruptive. Issues involving the state vis-a-vis grazing fees, grazing capabilities, rangeland management procedures, land exchanges, and use of uncontrolled lands have appeared and will require attention.

# VI. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

This chapter discusses the productivity of the environment which would be affected by the implementation and operation of the proposed action. The proposed action will be a long-term commitment of resources that will require some short-term use and trade-offs of these resources. Short-term is defined as the period of implementation, now through 1985,* while long-term means at least up until the year 2000.

## ANALYSIS

### 1. Air Quality

While air quality is not strictly-speaking a "usable" resource, it is nevertheless affected by the proposed action. In the short term, the construction of new improvements will generate 6673 tons of particulates. This will occur over a four-year period at localized sites throughout the ES area. The duration of any one project is not expected to exceed two weeks maximum, with the dirt reservoirs and vegetative manipulation generating the worst conditions. The long-term benefit will be the ability to establish the rest rotation systems, reduce livestock and wildlife forage competition, improve the range conditions, and reduce the wind erosion particulates area-wide by 36,400 tons annually.

### 2. Geology and Topography

The impacts on these environmental elements are considered minimal in both the short and long term. Moreover, the proposed action will not significantly alter their character, condition, or form.

### 3. Soils

The disturbance of 310 acres for improvements will in the short term present a potential for erosion of about 0.04 acre-feet per year. Similarly, vegetative manipulation areas will have a sediment yield of 1.3 Aft/yr until stabilization can take place (approximately 2-3 years).

In the long term the proposed action will reduce the total sediment yield by 10.7%, thus reducing the erosion hazard and the potential for flooding and dust storms.

### 4. Water Resources

The implementation of the AMPs will not affect the water quality of the ES area significantly either in the short or long term. The additional development of 156 water sources, 95 troughs, and 92 miles of pipeline will provide specific waters for livestock and for wildlife that are not currently available except for some sporadic springs in the mountains.

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*Includes gearing up for implementation, cattle reduction, the 1980-83 construction period, and AMP introduction.

5. Vegetation

In the short term, the construction of improvements and vegetative manipulation will remove 2935 acres from vegetal production. Wildlife and livestock will have to adjust to this initial reduction in vegetation by shifting to other areas for forage, thus causing a short-term but minor increase in use since livestock numbers will be reduced.

The CQT allotment will experience the greatest use as 15 acres are required for facilities and 22 acres for improvements. In the long term, productivity will be regained on 2625 seeded acres of the Truxton and Mt. Tipton allotments. A total of 310 acres is therefore permanently lost for production purposes.

In the long term, forage production and vegetative cover will be increased through the improvements and implementation of the AMPs. Moreover, the vegetative species of the area will be enhanced with the identification, monitoring, and subsequent protection of riparian sites and the threatened and endangered plants. The use of the vegetative resource in establishing the proposed rest rotation systems will be adverse in the initial pastures as more cattle will be concentrated in a smaller area as compared to present practices. During this time the Big Ranch, Black Mountain, Ft. McEwen, and Castle Rock allotments will have the slowest response to change as they have a low soil potential for forage production. It is difficult to determine the duration of adjustment as it will be dependent on variable climatic conditions. The long-term productivity of the range, and therefore vegetation, is expected to be enhanced even though there are these initial adverse impacts.

6. Animals

There is expected to be some additional competition between livestock and animals for forage as the AMP range management practices are being instituted and the rest rotation pastures are being established. This will be most evident in the Ft. McEwen allotment with significant deer and bighorn sheep populations and CQT and Upper Music with large deer populations, The long-term productivity of the wildlife is expected to improve, however, as more water sources are provided and more forage is made available.

Similarly, there will be a short-term disturbance of some habitat areas within the 2935 acres required for water developments and range improvements. This will be particularly true around the 22 spring developments (4.5 acres) and 27 horizontal wells (7 acres). The fencing of such areas to keep out cattle and the provision of wildlife waters will enhance the future productivity of the animals.

7. Land Use

The short-term use of the land in an areal sense is not expected to change significantly relative to the proposed action nor impair the long-term productivity for vegetation or wildlife. While subdivision activity may occur and limit the productivity of the resource for grazing animal and wildlife uses, it will not be caused by the proposed action.

The extent to which increased recreational opportunities will limit the productivity of the animal, wildlife, and natural resources through disturbance or vandalism is not quantifiable at this time. It is noted that the improvement in the range condition is anticipated to increase recreational use-days by 22% in the long term, primarily for sightseeing purposes.

8. Natural Hazards

The short-term use of the environment will result in an increased potential for erosion and runoff because of construction activities. Similarly, there will be no apparent reduction in either flood control or dust storm hazards in the short term as improvements in range conditions will come about slowly. There will also be a short-term increase in particulates as noted above. These hazards are not expected to restrain the long-term improvements in range conditions and will, in turn, be reduced by such improvement.

The fire hazard, although small and mostly occurring along I-40 and Route 66, will remain about the same in the short term. The long-term trend in increased litter and vegetation will result in a higher fire potential. Such potential burns will reduce productivity temporarily. Past history would indicate, however, that this will not occur on a large scale.

9. Cultural Resources

The archaeological clearance required prior to any improvement construction is likely not to result in salvage as the cultural resource can generally be preserved in situ. Some unintentional damage or destruction could still occur to undiscovered subsurface sites. The two areas most likely to result in loss or damage are the chain and burn areas in the Truxton and Mt. Tipton allotments. Salvage operations could partially mitigate any loss of information. However, once excavated, a site is effectively lost and removed from any future consideration. Salvage is not nearly as effective as in situ protection because of limitations in time and resources, though properly conducted scientific salvage may enhance the long-term opportunities for better understanding of ES area history.

Cultural damage from vandalism and from cattle trampling will continue through the short term and into the future. The protective methods designed in the proposed action and the mitigating actions will reduce but not eliminate this damage, thus limiting the cultural opportunities for future generations.

10. Natural Environmental Areas

The potential for enhancing and protecting the natural, primitive and wilderness values of the identified sites in the ES area is apparent. A number of MFP decisions (see Table I-14 and Figure I-13) have indicated the BLM's awareness of this opportunity. The extent to which the BLM in the short term implements Section 102(a)(11) of the Land Policy Act will protect these areas for future use. In the short term it appears that Willow Springs and Mt. Nutt areas lying within parts of Ft. McEwen and Black Mountain allotments, respectively, are not in good condition and the competition for forage between wildlife and livestock is potentially damaging the primitive and other values irreparably.

The scenic areas will essentially be maintained for the long term because of their remoteness or inaccessibility, except for the Pack Saddle and Windy Point areas. The latter areas are already established camping areas and have been proposed for expansion.

11. Visual Resources

In the short term the visual resources will be adversely affected in the localized areas of construction for improvements and vegetative manipulation. These disruptions will occur throughout the 1980-83 period. Visual resource analysis before construction and strict adherence to specifications regarding visual sensitivities should mitigate these impacts for the long-term enhancement of the environment.

12. Socioeconomic

As discussed in Chapter III, the economic impact of the proposed action will result in a reduction of cyls from 7623 to 6020 and a loss in value of $1.17 (to $6.24 million) to the private landowners. At the same time, they will realize an estimated gain of $440,000 from the sale of 1603 cattle. With the construction of range improvements by 1985, the value will rise to $6.77 million and a maintenance cost of $8,200 annually will be incurred. In this short-term period the ranchers will contribute their own labor valued at $112,000 and the total net full-time equivalent employment will range from 23.9-34.5. A total net income of $377,700-609,900 will also be realized.

This short-term use of resources will result in an increase in ranch values to $7.6 million in the future. Moreover, the cattle will increase from 6020 initially to 7054 cyls. In the long term, the net return to the

rancher on operations will range from $51,000-257,800. The total net employment will be 15.7 FTE jobs, but ranch employment will drop by three. Once the construction period is over, total net income will decrease to $175,800, although this is slightly more than double what it is estimated to be in 1979.

The BLM will incur a cost of $1.36 million in the short term for improvements. The long-term effect as management practices are implemented under a favorable moisture regime will be improved range condition and enhancement of the total environment.

The mitigating actions as described in Chapter IV will also increase the BLM cost obligations by $468,000.

The implementation of the AMPs will most likely affect the attitudes of most ranchers who feel their rights to unrestrained resource use are being abridged and that the BLM is imposing an undue burden and imposition on their way of life. The extent to which this is altered in the future is difficult to ascertain. Historically, distrust has been prevalent and, while it might be lessened by the proposed action, there are too many variables to indicate what the mood will be. It does appear, however, that the traditional life-styles and values of the ranchers will be maintained regardless of the proposed action.

13. Institutional

The short-term use of BLM resources will involve an increase in BLM staffing and a priority allocation of funds to the ES area over those in the rest of the state. The BLM will be under pressure to generate funds for construction and not delay AMP implementation. This effort will also intensify the need for BLM to cooperate with other agencies at all levels. Realization of this cooperation will heighten some issues, such as the exchange of lands, land use development controls, grazing land protection policies, realization of fees, determination of grazing capacity at the state and Federal level, and use of the uncontrolled lands.

The degree to which these issues are satisfactorily resolved is not determinable for the long term. The potential is there to be realized and there are signs that the BLM and others are aware of the situation to the general betterment of institutional relations and management of the resource.

# VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This chapter identifies the irreversible and irretrievable commitment of resources resulting from the proposed action. Irreversible is defined as that use incapable of being reversed: once something is initiated, it will continue in use. Irretrievable means irrecoverable: once something is used, it is not replaceable.

## 1. Air Quality

Implementation of the proposed action will not result in any irreversible and irretrievable deterioration of the ES area air quality.

## 2. Geology and Topography

Implementation of the proposed action will not result in any irreversible and irretrievable commitment of geologic resources.

## 3. Soils

During the construction period approximately five acre-feet of sediment loss will occur throughout the ES area. Similarly, about three Aft will be lost during the vegetative manipulation process on Mt. Tipton and Truxton Canyon allotments. The grazing actions will also cause a loss of 0.5 to 0.6 Aft of sediment annually around the new water developments for the life of the project. This loss of soil, however, is associated with the improvements needed to define pastures and provide additional water.

## 4. Water Resources

The development of new water sources will result in a commitment of between 27 to 45 Aft of this resource to storage for wildlife and livestock use. These waters would therefore not be available for other purposes throughout the project life.

## 5. Vegetation

The prime commodity to be used in the establishment and operation of the proposed action is land. Use of land for livestock grazing cannot be considered either irreversible or irretrievable except to the extent the land is used for operational facilities or improvements or developments. There are 64 water developments, including 95 troughs plus 92 miles of pipeline, and 28 range improvements plus 164 miles of fencing. The total land used, 310 acres, for these purposes would be removed from vegetative production.

6. Animals

Implementation of the proposed action will not result in any irreversible and irretrievable deterioration of the ES area animals.

7. Land Use

Implementation of the proposed action will not result in any irreversible and irretrievable commitment of land uses.

8. Natural Hazards

Implementation of the proposed action will not result in any irreversible and irretrievable natural hazards.

9. Cultural Resources

The principal irretrievable commitments of cultural resources as a result of the proposed action consist of surface collection and excavation of sites in the areas proposed for chaining and burning of vegetation, and of sites that might be affected by range improvements that could not be relocated; the loss of artifacts from vandalism, the breakage and displacement of artifacts as a result of trampling by domestic stock, and the potential damage to surface and subsurface cultural deposits from controlled burning and wildfires. Each of these activities must be considered to result in an irretrievable commitment of cultural resources since the resources affected are non-renewable. Further, the adverse effects of trampling and wildfires will continue as long as the proposed action is in effect. Each disturbance of an archaeological site constitutes a loss of irreplaceable data concerning the prehistoric and historic use of the ES area.

10. Natural Environmental Areas

The extent to which the BLM does not adequately identify, study, and protect those areas having primitive and wilderness values can be considered a loss of resources. While the reduction in cattle will reduce the pressure in those areas noted in Chapter II-B10, continued grazing threatens the loss of this unquantified and unqualified potential.

11. Visual Resources

Implementation of the proposed action will not result in any irreversible and irretrievable deterioration of the ES area visual resources.

12. Socioeconomic

The commitment of financial resources and associated labor for construction in the amount of $1.36 million, plus approximately $310,000 for mitigating and monitoring actions, can be considered irreversible for the life of the project. Once the commitment is made, these funds will not be

available for other purposes. This commitment, however, is necessary for establishing and operating the proposed action. Further, these resources are retrievable in the sense that the BLM will increase its fees in the long run from $74,600 (at initial stocking rate) to $87,400 annually. Moreover, the rancher will be able to increase the value of the ranch to $7.6 million (the current value) after the initial stocking rate decreases to $6.44 million.

This financial commitment will also enable 10* of the 18 ranchers to realize some return from grazing operations. This could amount to $3,200 for the average ranch. Further, if the rancher utilizes the opportunity to improve management practices, the return could be as high as $13,300 over the long term.

The commitment of labor to the construction of improvements once expended cannot be retrieved. The value of this labor, however, in terms of income derived, will amount to $622,200 over a four-year period. The commitment of five additional BLM staff and an associated annual salary of $65,000 to the Kingman area for project implementation and management can also be considered irretrievable. Further, these staff and funds will not be available for other areas in the BLM district or state jurisdiction. The effective administration of the project as described in Chapter I, including range management and range surveys, will require this commitment.

## 13. Institutional

Implementation of the proposed action will not result in any irreversible and irretrievable deterioration of institutions in the ES area.

*It is assumed that those with less than 100 cyls will continue to only break even.

## VIII. ALTERNATIVES TO THE PROPOSED ACTION

In the preparation of this chapter eight conceptual alternatives were identified:

- Adjustable stocking rates with a deferred grazing system,
- Wildlife effective management,
- Feed substitution program,
- No-action alternative,
- Temporary removal of livestock,
- Custodial management of public lands,
- Removal of livestock from public lands, and
- Longer-term implementation of the AMPs.

The evaluation and selection process resulted in the consolidation of these alternatives into the five presented below. It is noted that the wildlife effective management and feed substitution program alternatives were incorporated into the mitigating measures under future opportunities. Longer-term implementation was incorporated into the management practices of the proposed action (Chapter I) under the subsections on flexibility and evaluation.

All 23 perennial allotments, the three ephemeral, and the eight custodial allotments are considered under the five remaining alternatives, as are the objectives of the proposed action as stated in Chapter I. These alternatives were selected on the basis of their being realistic options that can be implemented.

The alternatives discussed in the following pages include (a) adjustable stocking rates with deferred grazing systems, (b) site-specific grazing systems at 50% utilization, (c) limited action, (d) no action, and (e) removal of livestock grazing from public lands. The major impact findings and characteristics of these alternatives are summarized in Table VIII-1 The characteristics are compared with the existing conditions, future trends without the proposed action, and the proposed action.

TABLE VIII-1

COMPARISON OF EXISTING CONDITIONS, FUTURE TRENDS WITHOUT AMPS, PROPOSED ACTION, AND ALTERNATIVES

| | | 1 | | 2 | 3 | | 4 | 5 | | 6 | 7 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Air Quality | | Geology and Topography | Soils | | Water Resources | Vegetation | | Animals | Land Use | | |
| Management Actions[a] | Cyls[b] | Particulate Tons/Yr (000) | Days Standards Exceeded | | Sediment Loss (aft/yr) | Erosion Hazard | Use and Quality | Range Condition | Time for Improvement | Habitat Quality | Land Uses | Grazing Practices | Recreation |
| Existing Conditions | 7,623 | 496 | 7 | — | 686 | Low to very low | Moderate use, good quality | Fair to poor | — | Fair to poor | — | Yearlong | Declining |
| Future Trends Without AMPs | 7,623 | 550 | 20 | No change | 755 | Minor increase | No change in use or quality | Continued steady decline | — | Slow decline, varies with species | No change | Yearlong, 5% cattle weight loss, 65% calf crop | Continued decline |
| Proposed AMPs | | | | | | | | | | | | | |
| Short-term | 6,020 | 466 | 10 | No change | 612 | Minor decrease | No measurable change, slight increase in use | Gradual improvement | Long term, 20 years plus | Gradual improvement | No change | Rest rotation, deferred, Santa Rita; 10% cattle weight increase, 65-85% calf crop | Slight increase |
| Long-term | 7,054 | | | | | | | | | | | | |
| Alternative A | | | | | | | | | | | | | |
| Short-term | 3,746 | 447 | 6 | No change | 612 | Minor decrease | No measurable change, slight increase in use | Gradual improvement with option for acceleration | Long term, 10-20 years | Gradual improvement with option for acceleration | No change | Site-specific deferred, 10% cattle weight increase, 65-85% calf crop | Slight increase |
| Long-term | 7,054 | 466 | 10 | | | | | | | | | | |
| Alternative B | | | | | | | | | | | | | |
| Short-term | 6,589 | 472 | 10 | No change | 612 | Minor decrease | No measurable change, slight increase in use | Gradual improvement | Long term, 20 years | Gradual improvement | No change | Site-specific plans, 10% cattle weight increase, 65-85% calf crop | Slight increase |
| Long-term | 6,589 | | | | | | | | | | | | |
| Alternative C | 6020 | 545 | 12 | No change | 686 | Stable | No change in use or quality | Continued gradual decline, slower than future trend | — | Continued decline at slower rate than trend | No change | No management plans, yearlong 5% cattle weight loss, 65% calf crop | Static |
| Alternative D | 7,623 | 550 | 20 | No change | 755 | Minor increase | No change in use or quality | Continued steady decline | — | Slow decline, varies with species | No change | Yearlong, 5% cattle weight loss, 65% calf crop | Continued decline |
| Alternative E | 2,409[h] | 389 | 4 | No change | 612 | Minor decrease | Decrease in use, no change in quality | Steady improvement at a natural rate | Long term, 10-20 years | Steady improvement toward natural populations | Grazing use eliminated | Yearlong, limited to private lands | Moderate increase |

a. Mitigating measures are considered as part of these actions.
b. Includes cyls on custodial lands.
c. Values in 1977 dollars.
d. Includes ranch, construction, and BLM employment.
e. Direct, indirect, and induced.
f. Based on AUMs on Federal lands.
g. Includes costs of improvements and mitigating measures.
h. Cyls on private and state-controlled lands.
i. Includes one year of maintenance costs.

**Source:** Chapters II, III, IV, and VIII.

| Environmental Elements | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | | 9 | 10 | 11 | | 12 | | | | | | | | | | | | | 13 |
| Natural Hazards | | | Natural Environmental Areas | Visual Resources | | Socioeconomic Conditions | | | | | | | | | | | | | |
| Flood and Dust | Fire | Cultural Resources | Protection | Improvements, Change | Grazing Change | Herd Value (millions) | Ranch Value (millions) | Operational Return, Average Ranch | Net Direct Employment[d] | Net Total Employment[e] | Total Net Income (000) | Assessed Valuation (millions) | Local Revenues (000) | BLM Fees[f] (000) | State Fees (000) | Improvement Costs[g] (millions) | Community Well-being | Ranch Well-being | Institutional Agreements |
| Low | Low | Fair to poor | None existent | – | – | $1.97 | $7.62 | ($ 210) | – | – | – | $1.37 | $109.7 | $94.5 | $7 | – | – | – | – |
| Increase | Decrease | Increased deterioration at increased rate | Further loss of quality and value | None | Decline in contrast and texture, VRM Class IV to V in valleys | 1.92 | 7.47 | (2,700) | – | – | – | 1.34 | 107.6 | 94.5 | 6 | – | No change | Decreased conflict | No change |
| Decrease | Slight increase | Increased deterioration at less than existing rate | Limited enhancement of quality and value | Short-term localized disturbance | No change in VRM class, improved contrast | 1.55 | 6.44 | (1,340) | 18 | 35 | 609.9 | 1.17 | 93.6 | 74.6 | 6 | $ 1.83 | No change | Initial increase in conflict | No change |
| | | | | | | 1.90 | 7.60 | 3,200 | 10 | 16 | 175.8 | 1.36 | 108.8 | 87.4 | 7 | – | | | |
| Decrease | Slight increase | Increased deterioration at less than existing rate | Definite enhancement of quality and value | Short-term localized disturbance | No change in VRM class, improved contrast | .97 | 4.80 | (400) | (19) | (25) | (128.0) | .86 | 69.1 | 46.4 | 4 | .47 | No change | Significant initial increase in conflict | No change |
| | | | | | | 1.90 | 7.60 | 3,200 | 10 | 16 | 175.8 | 1.36 | 108.8 | 87.4 | 7 | 1.22 | | | |
| Decrease | Slight increase | Increased deterioration at less than existing rate | Limited enhancement of quality and value | Short-term localized disturbance | No change in VRM class, improved contrast | 1.7 | 6.85 | (90) | (5) | (6) | (34.2) | 1.23 | 98.6 | 81.7 | 7 | .47 | No change | Some initial increase in conflict | No change |
| | | | | | | 1.78 | 7.15 | 1,310 | – | 8 | 99.5 | 1.29 | 102.9 | 81.7 | 7 | 1.22 | | | |
| Stable | Stable | Increased deterioration at increased rate | Further loss of quality and value | None | Decline in contrast and texture, VRM Class IV to V in valleys | 1.52 | 6.41 | (2,330) | (8) | (11) | (52.9) | 1.15 | 92.3 | 74.6 | 6 | .34 | No change | Some initial increase in conflict | No change |
| Increased | Decreased | Increased deterioration at increased rate | Further loss of quality and value | None | Decline in contrast and texture, VRM Class IV to V in valleys | 1.92 | 7.47 | (2,700) | – | – | – | 1.34 | 107.6 | 94.5 | 6 | .29 | No change | Decreased conflict | No change |
| Moderate decrease | Moderate increase | Continued deterioration at much lower rate than existing | Significant enhancement of quality and value | Severe | No change in VRM class, improved contrast | .62 | 3.63 | (490) | (26) | (34) | (172.3) | .65 | 52.2 | (94.5) | 2 | 13.2[i] | No change | Significant increased conflict | Cancellations |

## A. ADJUSTABLE STOCKING RATES WITH DEFERRED GRAZING SYSTEMS DESCRIPTION

### Description

The basic intent of this alternative is to establish a permanent low base herd figure on all allotments below the current estimated grazing capacity and at a level that could be carried through even the poorest forage years. Annual evaluation of the range by the BLM will be used to determine the number and season of additional temporary livestock use above the base figure. The grazing system to be instituted will be allotment-specific variations of deferred grazing. This alternative is based upon the following assumptions:

- Initial stocking will be at 50% of current estimated grazing capcacity on all allotments including custodial. This number, 3746 cyls, becomes the low base herd.
- Annually, additional livestock numbers will be permitted above the low base herd on the basis of available forage and the relative condition of the range. This number and season of use will be determined by the BLM.
- Allotment-specific variations of deferred rotation grazing systems will be instituted over a three-to-five year period on the basis of continuing accrual of range data from monitoring studies described in Chapters I and IV.
- Range improvements will be proposed in line with the specific management requirements of the system(s) to be implemented on each allotment and will be installed incrementally over a five-to-ten year period. Livestock control through water management will be used as a control measure. The improvements will be comparable to those proposed for the AMPs except for 44 miles less of pasture fencing. No improvements will be installed on those allotments located in the natural environmental areas except for 11 new spring developments (see Table II-55). Improvements on the custodial allotments will also be developed but they cannot be determined at this time.
- Management plans for the three ephemeral allotments will be based upon 50% use of available forage and managed in accordance with Ephemeral Range Special Rule, Title 43, CFR 4115.2-4.
- All mitigating measures as described in Chapter IV will be implemented.
- The management objective for wild horses and burros will be 14 horses and 145 burros.
- Easements and permits will be accommodated as at present.

Analysis

1. Air Quality

The effect of grazing a low base herd at 50% of estimated capacity will be to reduce particulate emissions by about 10% to 447,000 tons per year. This will result from a 12-15% reduction in wind erosion particulates, or about 50,000 tons per year. There will still be 6500 tons of particulates emitted as a result of vegetative manipulation on 2625 acres and another 73 tons resulting from range improvements. Emissions from vehicles in the area will be similar to current volume, or about 101,000 tons per year. It is noted, however, in the long term that emissions will be about equal to that of the proposed action, 466 tons per year.

The valley areas will still contribute the greatest amount of wind erosion emissions because of their physical and vegetative characteristics as described in Chapter II-B1 and Appendix B. Improvement in range conditions, however, will reduce this from 37% to 33% of the total wind erosion emissions, or a reduction of 33,000 tons from 291,800 tons under present conditions. There will still be about six-to-seven days when violations of state standards will occur.

The effects of construction improvements will be as described for the proposed action in Chapter III-B1.

2. Geology and Topography

There will be no measurable change in the geologic or topographic character of the ES area, nor will there be any effects upon paleontology.

3. Soils

As initial livestock numbers will be lower than at present and range improvements will be incrementally introduced, there will be a reduction in sediment loss of 37.98 acre-feet per year for the ES area. The total number of range improvements will be about equal to the proposed actions, except for 16 storage tanks, 2 reservoirs, 3 vertical wells, 3 horizontal wells, 17 troughs, 4.5 miles of pipeline, and 18 miles of fencing in the natural environmental areas. The reduction in soil impacts as described in Chapter III-B3 will be comparable over time.

As the custodial allotments will be intensively managed under this alternative, it is expected that the erosion effects and sediment loss will be less than at present. This reduction is not measurable as no data exist on custodial lands.

4. Water Resources

Although there will be a more gradual development of range improvements under this alternative than projected under the AMPs, the total number of water developments will be the same. There will, therefore, be increased

use of groundwater from 14 vertical wells, 27 horizontal wells, and the development of 22 springs. The increase on custodial lands cannot be determined because of lack of information. The regional water levels are not expected to decline as a result of the development and use of these new water sources. Similarly, no appreciable change in the recharge of the valley aquifers or in the quality of the water is expected.

An increase in ground cover over time as a result of improving range conditions will create a more favorable opportunity for precipitation to be used on site, thus reducing marginally the amount of overland flow that results from low-intensity storms. Significant flows generally resulting from high-intensity thunderstorms or long duration winter storms will not be affected by this action.

5. Vegetation

a. General Description and Phenology

The initial effect of this alternative will be insignificant relative to the existing plant communities and phenology. In the long term, the design of site-specific management plans based on a deferred grazing system will allow for full phenological development of key forage species. The 50% initial reduction in cattle will provide the opportunity for such development to occur sooner than under the proposed action.

b. Vegetative Condition of the Range

The grazing pressure of a low base herd will be significantly less than now, allowing for plant vigor and reproduction on a wider and more regular basis. Furthermore, the annual determination by the BLM of the number of additional livestock to be grazed, the season of use, and choice of pastures will allow for greater flexibility and response to actual conditions. Moreover, the low base herd will significantly reduce the element of error in establishing grazing capacities. When, and the extent to which this will occur, however, are not readily discernible as only apparent trends in condition are known and more site-specific data are required.

With the annual option of a best pasture and/or pastures management scheme for the low base herd and the additional livestock numbers, there will be a good opportunity for improving range condition during average or above-average rainfall years. As the number of cattle will be determined relative to conditions during years of below-average rainfall and limited forage production, herds will be maintained at a low base level only, thus ensuring a limited impact upon the resource during the poor years.

Following several years of management under this system, the BLM may opt to increase the low base herd number commensurate with improved range conditions. By the same token, as the range trend continues upward, the current estimated grazing capacity could well be increased indicating a potential for additional licensed livestock numbers.

c. Threatened and Endangered Plant Species

Under this alternative, vegetative vigor and diversity should improve over time since the deferred grazing systems are designed to meet the physiological needs of the forage plants. Non-forage plants and threatened and endangered species should also benefit. The phenology and physiological requirements of the T&E species are little known, but the annual surveys and monitoring set up under this alternative should provide relevant information. This will be particularly important for the seven of nine T&E species known to occur on the ephemeral range.

d. Poisonous Plants

The annual toxic plants of the ES area are prone to occupy disturbed space or range sites that are in poorer condition. The possibility of partially arresting this occurrence is high under this alternative because of the low level of yearlong stocking and thus reduced grazing pressure. Furthermore, additional stocking will be in relation to forage availability and range condition indicators, thus reducing the potential for creating pockets of disturbed space. Considering that this alternative presents a good opportunity for rapid range improvement, the incidence of livestock poisoning should decrease.

e. Ephemeral Range

This alternative should cause no change in the management of the three ephemeral allotments and ephemeral portions of other allotments as they will be managed in accordance with the Ephemeral Range Special Rule, Title 43, CFR 4115.2-4. This situation should allow for vegetative improvements, although no definitive assessment can be made at this time.

f. Custodial Range

The institution of this alternative will dramatically benefit these allotments as controlled management will be instituted in lieu of historical custodial or "caretaker" management.

It will be necessary to determine the current estimated grazing capacity and range condition before establishing the low base herd number for each allotment. Assuming that the current allowable use numbers are the current estimated grazing capacity, then the low base herd figure will be established at 173 cyls for four allotments -- Cook Canyon, Jones Spring, Valentine, and Hualapai.

On the other four custodial allotments (Feldspar, Long Mountain, Peacock Mountain, and West Peacock) where livestock numbers are not controlled, the current estimated grazing capacity will have to be determined before arriving at a low base herd number.

g. Vegetative Manipulation

The blackbrush burning and seeding of 1920 acres on Mt. Tipton allotment and pinyon-juniper chaining and seeding of 705 acres on Truxton Canyon will occur as discussed in Chapter I. The impacts of each action will be the same as described in Chapter III-B5. The same mitigation measure as indicated in Chapter IV for the pinyon-juniper chaining and seeding on Truxton Canyon will apply under this alternative.

h. Riparian Habitats

Although the data on riparian vegetation is limited, it is evident that the 50% herd reduction will reduce the grazing pressures on these habitats. The condition of the riparian vegetation will improve in about the same degree and time as the range conditions in general. Furthermore, the protection of riparian sites where 27 additional spring waters are developed as described in Chapter I will be beneficial as sufficient water will remain for vegetative needs and livestock will be excluded. Judicious placement of the troughs away from such vegetation and the use of water traps will also reduce the adverse impacts that result from concentrated use at such sources.

6. Animals

The minimum level of wildlife forage and protective cover made available on public land during the initial implementation of this alternative is estimated at 20,963,712 pounds per year in excess of the proposed action. On the 20 allotments with range trends which are downward or not apparent, the 50% reduction in initial livestock numbers will promote a relatively quick regeneration of natural plant communities and therefore wildlife habitat. Three ES area allotments showing an upward trend in range conditions (Cedar Canyon, Clay Springs, and Pine Springs) will experience a 10% reduction in initial stocking levels. Since wildlife habitat quality appears to be improving within these allotments, this minor reduction in livestock numbers will provide wildlife with adequate reserves of forage and protective cover. Further, the annual adjustments in allotment stocking rates (resulting from monitoring range conditions and forage availability) will benefit wildlife populations indefinitely by ensuring permanent reserves of forage and cover during years of drought or extended winter. The reduction of cattle and construction of water developments only in the crucial habitat areas, as shown in Figure IV-1, will further benefit wildlife by reducing livestock competition and providing additional water.

a. Mammals

(1) Ungulates. Although native ungulate populations will not increase significantly beyond wildlife objectives established for the proposed action, adjustable stocking rates with deferred rotation grazing systems could prove more effective in improving the quality of ES area mule deer, pronghorn, and desert bighorn habitat by providing adequate reserves of forage and protective cover. This will reduce or diminish short-term forage competition between cattle and native ungulates.

(2) Carnivores. The institution of this alternative will benefit ES area mountain lion populations by improving habitat conditions for important prey species. The anticipated increase in game bird, perching bird, cottontail rabbit, reptile, and amphibian densities will also benefit local coyote, bobcat, gray fox, kit fox, ringtail, and badger populations. However, the anticipated reduction in rodent densities could decrease the prey base for ES area carnivores. The overall impact of this alternative on local carnivore habitat is uncertain.

(3) Small Mammals. Under this alternative, improved vegetative conditions should provide ES area cottontail rabbits and pocket gophers with additional forage resources. In contrast, most rodent species may experience population declines due to plant succession which favors forbs and perennial grasses rather than disturbance plants.

b. Wild Horses and Burros

The impacts of an intensive management program for ES area wild horse and burro populations will be similar to those of the proposed action (see Chapter III-B6).

c. Birds

(1) Upland Game. The decreased exploitation of palatable plants, normally utilized by ES area quail and doves for protective cover and food sources, will promote increases in local Gambel's quail, mourning dove, and white-winged dove carrying capacities.

(2) Raptors. With improved vegetative vigor and diversity of ES area rangelands, habitat conditions for local raptor species will improve slightly. Additional protective cover for raising young and increased densities of perching birds and game birds may promote improved reproductive success of local raptor populations. The impact of possible reductions in rodent densities on local raptor populations is unknown.

(3) Aquatic. Adjustable stocking rates with deferred rotation grazing systems will have no effect on aquatic birds of the ES area.

(4) Nongame. Most local nongame bird populations will benefit from this alternative due to the anticipated increase in forage availability and protective cover.

d. Amphibians

The implementation of this alternative will improve ES area amphibian habitat by increasing the abundance of plant litter which will aid in retaining soil moisture.

e. Reptiles

The improvement of range conditions on ES area allotments will benefit inhabiting reptile species by providing additional forage and protective cover.

f. Invertebrates

The habitat quality for ES area invertebrates will return to a more natural state. Such a condition will result in increased invertebrate diversity rather than high populations of a relatively small number of species.

g. Threatened and Endangered

The desert tortoise will benefit from the increased availability of forage plants (grasses and forbs). Habitat conditions for Gila monsters and zone-tailed hawks will also improve due to the greater abundance of protective cover and the increased density of many prey species.

h. Riparian

The impacts on ES area riparian habitat will be similar to those of the proposed action with one exception: the development of fences (traps) around water sources for the management of livestock. This could temporarily reduce the quality of mule deer, desert bighorn, pronghorn, wild horse, and burro habitat by restricting access to spring-site water troughs within crucial ranges.

7. Land Use

a. General Characteristics

Livestock grazing will continue to occupy the same acreages as currently occupied, though the use patterns will change somewhat as variations of deferred grazing systems are developed over time for each management unit. The probability of land ownership patterns changing dramatically as a result of this alternative is not apparent. Those acreages earmarked for exchange and disposal by MFP decisions are expected to remain in the same use category.

The use of land for subdivision purposes is not expected to be changed by this alternative in relation to current trends. Similarly, lands for rights-of-way or other localized uses will be the same as currently expected.

b. Recreation

Land use for recreational purposes within the ES area will not change appreciably. New areas to be developed and use demands will be as described in Chapter II-B7. The impacts on recreation will be similar to those described in Chapter III-B7. Opportunities to respond to changing recreational use patterns and emphases will be available as annual assessments and decisions are made by the BLM.

c. Agriculture and Forest Products

Potential agricultural development as a land use within the ES area will depend on conditions and factors other than contained in this alternative. No major changes are expected and existing uses will most likely prevail.

The potential for harvesting wood products will not change appreciably from current opportunities.

d. Livestock Grazing

With the implementation of this alternative, the initial stocking rate for the 23 perennial allotments, including the custodial portions, will be 3746 cyls (Table VIII-2 below). These cyls will become the constant low base herd for each allotment. Each year additional livestock numbers will be permitted over and above the constant low base herd figure on a temporary basis as determined by the BLM after consideration of forage and other range condition factors. The combined total of the low base herd numbers plus the annual supplemental numbers will not exceed the current estimated grazing capacity during the grazing year.

The pattern of cattle shipments and sales in Mohave County as described in Chapter II-B12 will not change significantly under this alternative. Cattle shipments will be the same as the future trends but the exact number will vary annually depending on market conditions and number of cattle licensed temporarily. Cattle weights will not change initially from current conditions but they are estimated to increase by 10% in the long term as compared to a 5% loss under future trend conditions. Cattle prices, however, will continue to follow the 10-year cycle typical of the past.

The cow/calf operations and breeding and culling practices will remain the same as in the past although there is an opportunity for efficiency to increase from 65% to 85%. Seasons of use, however, will change in response to annual evaluation of range conditions, adjustment in stocking rates, and the design of site-specific deferred grazing systems.*

Furthermore, with the low base herd it will be easier for the rancher to establish the best pasture management system as adjustments will entail smaller numbers and will be on a graduated basis.

e. Mineral Resources

No change from the existing condition and trends is expected.

f. Transportation

No change from the existing condition and trends is expected.

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*This system provides for the opportunity to improve the quality of the herd through selective culling while getting down to the low base herd figure.

TABLE VIII-2

HERD COMPOSITION AND INVENTORY VALUE - ALTERNATIVE A,
TOTAL INITIAL STOCKING RATE 3,746 CYLS

| Herd Composition | Cyl | Price per Pound | Weight (lbs) | Value |
|---|---|---|---|---|
| 50% Producing Cows | 1,873 | 22¢ | 1,000 | $412,100 |
| 20% Replacement Heifers | 749 | 37¢ | 600 | 166,300 |
| 5% Bulls | 187 | $400 each | | 74,800 |
| 3% Horses, Milk Cows | 112 | $300 each | | 33,600 |
| 11% Steers (sale type) | 412 | 40¢ | 520 | 85,700 |
| 8% Heifers (sale type) | 300 | 34¢ | 435 | 44,400 |
| 3% Cull Cows | 112 | 20¢ | 800 | 17,900 |
| Subtotal | 3,746[a] | | | $834,800 |
| 50% Heifers[b] | 496 | 40¢ | 300 | $ 59,500 |
| 50% Steers[b] | 496 | 48¢ | 300 | 71,400 |
| Subtotal | 992 | | | $130,900 |
| Total | 4,738 | | | $965,700 |

a. Includes cyls for custodial lands within 23 allotments.
b. Calfs one day old to yearlings based on 65% calf crop for producing cows and replacement heifers less sale-type steers and heifers.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

8. Natural Hazards

This alternative will have no impact upon flood potential although the increase in plant density will probably reduce the intensity of surface runoff flows. The areas identified in Chapter II-B8 and C8 as having the greatest potential for flooding will retain that potential. Given the variable characteristics of climatic conditions and flash flooding, no reliable prediction can be made as to number of floods, extent, or occurrence.

There is a distinct possibility that good grazing management will result in an increase in grass buildup as fuel for fires. Recent fire history within the ES area indicates that the incident is occasional, is predominantly man caused, and occurs generally along the more heavily traveled highways.

A gradual improvement in vegetative condition, which will be reflected in an increase in crown cover, plant density, and plant canopy cover, will reduce the incidence and intensity of dust storms. The extent to which this will happen, however, is not measurable as data on dust storms are lacking.

9. Cultural Resources

Cultural resources will continue to be adversely affected by trampling but at a lesser rate than under present conditions or future trend conditions. If stocking rates ultimately increase as vegetative conditions improve under this alternative, trampling rates and impacts could approach those of the proposed action as discussed in Chapter III-B9. Erosional impacts will lessen over time with increased ground cover. Localized areas around water sources will continue to experience the most direct impact.

10. Natural Environmental Areas

The natural areas with primitive and wilderness value and areas of critical concern are expected to benefit from the reduced grazing pressure of 50% less cattle on the range. Furthermore, as this reduction will occur almost immediately, there will be less opportunity for continued loss of these natural qualities. As the range improves, the cattle will also tend to stay at the lower elevations and not penetrate the rougher higher terrain where the four prime areas -- Mt. Nutt, Willow Springs, Mt. Perkins, and Black Mesa -- are located.

In the short term, the improvements proposed for these areas as noted in Table II-55 will not be installed, thus forestalling disturbance of these areas and ORV access. Long-term installation will be decided on the basis of range condition, number of cattle, and their need for additional water sources. Water for wildlife will be maintained at existing sources and 11 new sources will be developed in the Diamond Bar/Gold Basin, Cane Springs, Gediondia, and Ft. McEwen allotments. The most serious threat to

these natural areas will come from the large existing burro herd and will depend on the extent to which it is or is not managed. The four identified scenic areas are not expected to be impacted under this alternative.

11. Visual Resources

Existing visual characteristics of the landscape will not change under this alternative and the scenic and visual sensitivity levels, as described in Chapter II-B11, should not change appreciably. Management under the low base herd and seasonal deferment format will marginally enhance the visual characteristics through improved plant cover and range condition but will not alter current VRM classifications. The gradual introduction of range improvements will be less noticeable and will cause only very localized short-term visual disturbance.

12. Socioeconomic Conditions

a. Demographic Characteristics

This alternative will not affect population projections or characteristics for Mohave County as discussed in Chapter II-C12.

b. Employment

The impact of this alternative on employment will be comparable to that under future trends (Chapter II-C12).

c. Income

The direct income from ranching in the long term will not affect the total personal income projections for the county as a whole. The income situation will be comparable to future trends.

d. Livestock Grazing Activities

(1) Ranch Characteristics. Ranch numbers and size will not change significantly. A change in ownership patterns through land consolidation or sale of deeded lands may occur for reasons other than the alternative actions.

Though the constant low base herd stocking rate for the 23 perennial allotments will stand at 3746 cyls, the supplemental stocking in all years except the poor forage years could equal the potential estimated grazing capacity of 7054 cyls as existent range forage production and conditions suggest. The stocking rate during the grazing year will at no time exceed the current estimated grazing capacity of 6589 cyls.

Management of the eight custodial allotments will change measurably and their licensed numbers will be reduced as these lands are brought under more intensive control. Limited improvements on these custodial allotments will probably be needed to support a higher level of management. This, however, cannot be determined as no pertinent information exists on the custodial allotments.

The ephemeral units and ephemeral portions of the other allotments will be managed under the current Ephemeral Range Special Rule.

(2) Cattle Shipments. The pattern of cattle shipments and sales in Mohave County as described in Chapter II-B12 will not change significantly under this alternative. Cattle shipments will be the same as the future trends but the exact number will vary annually depending on market conditions and number of cattle licensed temporarily. Cattle weights are not expected to change initially from current conditions but they are estimated to increase by 10% in the long term as compared to a 5% loss under future conditions. Cattle prices, however, will continue to follow the 10-year cycle typical of the past.

(3) Herd Inventory Value and Composition. Assuming the initial stocking rate to be 3746 cyls under this alternative, the value is estimated as $965,700 as shown in Table VIII-2, compared with $1.92 million under future trends. Assuming that in the long term the cyls will number at least 7054 (base herd + temporary cattle) the value could increase to $1.9 million.

(4) Ranch Values. The estimated value of the ranches under this alternative will decrease by the initial sale of the herds to $4.8 million. This sale, however, will result in the ranchers realizing $1 million cash in hand. The land value is estimated to be $1.76 million, improvements $1.61 million, cattle $965,700, and machinery $460,000. In the long term, assuming the stocking level reaches 7054 cyls, the value of the ranch will increase to $7.6 million as compared to the future trend value of $7.47 million. The land and herd values will increase to $3.49 million and $1.9 million, respectively.

(5) Economic Operations of the Ranch. The average size ranch in the ES area operating at the low base herd level with a 65% calf crop will incur an annual loss of $400 compared with the current loss of $210; with an 85% calf crop, the return will be $4,510 (Table VIII-3). The loss with the 65% calf crop is overstated, as it is expected that in those years when rainfall is better than average and additional cattle are on the range, operational receipts will be higher. In the long run, at 7054 cyls the return is estimated at $3,200 compared to a loss of $2,700 under future trends.

(6) Indirect Economic Effects of Ranching. The impact on direct ranch employment will be a net loss of 19 jobs initially. In the long term a net gain of 10 jobs will be realized with the increase in cyls and improved range conditions and construction of improvements. The total net ranch-related employment will decrease to about 30 jobs initially but increase to about 45 jobs in the long term. This will be slightly below the 50 jobs estimated under future trends.

TABLE VIII-3

AVERAGE RANCH EXPENSES AND RECEIPTS – ALTERNATIVE A, INITIAL STOCKING RATE 3,746 CYLS

| Expense Item | Percent of Total Expense | O&M* Costs |
|---|---|---|
| Overhead | 23.2% | $ 3,780 |
| Labor | 15.3 | 2,490 |
| Machinery | 20.5 | 3,340 |
| Material | 12.3 | 2,000 |
| Custom Services | 1.5 | 250 |
| Interest | 9.0 | 1,470 |
| Depreciation | 18.2 | 2,970 |
| | 100.0% | $16,300 |

| Herd Composition | 65% Calf Crop | 85% Calf Crop |
|---|---|---|
| Cows | 139 | 139 |
| Replacement Heifers | 16 | 16 |
| Bulls | 8 | 8 |
| Market Steers | 45 | 59 |
| Market Heifers | 29 | 43 |
| Cull Cows | 14 | 14 |

| Receipts | Weight (lbs) | Price per Pound | Number of Head | Receipts | Number of Head | Receipts |
|---|---|---|---|---|---|---|
| Cows (cull) | 800 | $0.20 | 14 | $ 2,240 | 14 | $ 2,240 |
| Bulls (cull) | 1,100 | 0.30 | 2 | 660 | 2 | 660 |
| Heifers | 435 | 0.40 | 29 | 5,050 | 43 | 7,480 |
| Steers | 520 | 0.34 | 45 | 7,960 | 59 | 10,430 |
| Total Receipts | | | | $15,900 | | $20,810 |
| Total Ranch O&M | | | | 16,300 | | 16,300 |
| Total Profit or (Loss) | | | | ($ 400) | | $ 4,510 |

*163 cyls with $100/cow unit O&M, 1977 dollars.

**Sources:** Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

e. Government Revenues

Under this alternative, the initial annual BLM grazing revenues at the rate of $1.51 per AUM will be $46,400. This figure will be annually supplemented with licensing of temporary numbers at the same $1.51 rate per AUM grazed. In the long term, these revenues will increase to $87,400 with 57,980 AUMs on Federal lands. The amount available for improvements will be $21,850 annually.

State grazing revenues will not vary greatly from the present $6,000-7,000 annually.

The assessed ranch values will decline to $860,000 initially and the tax revenues to $69,100. The long term will show an increase to $1.36 million and $108.800, respectively at the current rates of 18% for assessment and $8 per $100 of valuation.

f. Support Facilities and Services

No change in current or future trends is expected under this alternative.

g. Social Well-being

The change in the grazing system as proposed in this alternative could influence marginal ranchers to consider selling their ranches and leaving the livestock business entirely. Others will consider liquidating their small herds but elect to live on their land. The required initial herd sale and the related adjustment period will, however, further aggravate the BLM/rancher relationship.

Basic life-styles and values will not change. But the relationship with BLM range personnel could improve as a result of increased efforts at cooperation on both sides -- for example, during the annual grazing review.

13. Institutions

The institutional requirements of the BLM will not vary appreciably from the present conditions. BLM range resource personnel requirements will probably increase by three-to-five persons in the long term.

Cooperative agreements between the BLM and other governmental agencies will remain in force. Land disposal and exchanges will be decided as at present. The BLM will incur a cost of constructing range improvements on both public and private lands in the amount of $470,000 initially and $1.22 million in the long term. The cost estimate is based on the proposed costs less fencing costs saved through use of water traps.

## B. SITE-SPECIFIC GRAZING SYSTEMS, AT 50% UTILIZATION DESCRIPTION

### Description

This alternative is designed to establish livestock grazing at a 50% utilization level on all 31 allotments within the ES area. The three ephemeral allotments will be managed at 50% of available forage under the Ephemeral Range Special Rule, Title 43, CFR 4115.2-4. Initially, there will be no attempts by the BLM to alter the present management systems on these allotments.

In essence, this alternative says the allottee may run his livestock until key management species within preselected sample areas reach the 50% utilization level of current year's growth, at which time livestock grazing for that forage year must cease. This alternative is based upon the following assumptions:

- Initial stocking rates will be in line with current estimated grazing capacities and thus be reduced to 6589 cyls including custodial lands.

- Adjustments in stocking numbers will be arrived at annually on the basis of actual use experience acquired in reaching the 50% utilization level of current year's growth of the key species within the sample areas.

- The proposed AMPs will be revised relative to site-specific conditions based upon a continuing monitoring program as described in Chapters I and IV-B. Grazing systems and seasonal use patterns will be planned on an allotment-specific basis and developed over time.

- Range improvements will be similar to those under Alternative A.

- All mitigating measures as described in Chapter IV will be instituted.

- The management objective for wild horses and burros will be 14 horses and 145 burros.

- Easements and permits will be accommodated in the same manner as at present.

### Analysis

#### 1. Air Quality

Grazing at 50% utilization on 23 perennial allotments and on the eight custodial allotments as well will have a positive impact upon the air quality within the ES area. It is estimated that the total area-wide particulate

emissions will be reduced by about 5% to 472,000 tons annually under this alternative. This reduction will result primarily from a decline of 25,000 tons in wind erosion particulates. In the short term, 6500 tons of emissions from vegetative manipulation will occur on the Mt. Tipton and Truxton Canyon allotments and about 73 tons will occur throughout the area from range improvements. State standards will be violated on about 10 days compared with 20 days under future trend conditions without the AMPs.

The valley areas will still be the location of the greatest amount of emissions, contributing about 34% of the total wind erosion emissions or 266,700 tons. This is approximately 30,000 tons less than future trends. The effects of range improvement construction will be as described in Chapter III-B1.

2. Geology and Topography

There will be no measurable change in the geologic or topographic character of the ES area as a result of this alternative.

3. Soils

The stocking level of 6589 cyls with a 50% utilization factor will be measurably different than initial and potential levels under the proposed AMP action. Consequently, the erosion and sediment loss will be 612-617 acre-feet per year, or about 69 Aft less than under future trends. Furthermore, the impact on custodial lands is expected to decrease.

The sediment loss and erosion potential from the implementation of range improvements will be approximately 1 Aft per year over a six-to-ten year period as site-specific grazing systems are developed.

4. Water Resources

The use of 63 new water developments will have only a marginal effect upon water resources. No measurable change in the quality of these waters is expected nor will groundwater recharge rates be affected.

5. Vegetation

a. General Description, Phenology, and Vegetative Condition of Range

Phenological development of the key management species will be favored under the 50% utilization level of management. As the allotments are monitored at this level of use, the opportunity to benefit the total vegetative community through development of site-specific grazing systems is increased.

b. Vegetative Condition of the Range (All Allotments Including Custodial)

The impacts of implementing this alternative will be comparable in most respects to the proposed action. Livestock numbers will be reduced

to the initial stocking rate of 6589 cyls. Livestock grazing levels will be monitored by the 50% utilization standard. This will ensure proper use of the resource since site-specific grazing systems will be developed on the basis of experience and additional data gathered as part of the monitoring system that will be instituted as under the proposed action.

c. Threatened and Endangered Plant Species

Vegetation vigor will increase considerably compared to existing conditions due to the better correlation of the systems with the sites. Threatened and endangered species will also benefit by this. Since the ephemeral ranges will be managed under the Ephemeral Range Special Rule, Title 43, CFR 4115.2-4, the same impacts will occur as under the proposed action (see Chapter III-B5) and the same mitigating and monitoring actions will be necessary as described in Chapter IV. The range improvements, and hence the impacts, will be the same as under the proposed action.

The annual surveys and monitoring programs set up under this alternative will contribute to better knowledge of the distribution, phenology, and habitat requirements of the T&E species than would be true under future trends.

d. Poisonous Plants

The incidence of livestock poisoning will decrease as ground cover increases, with improved range conditions under site-specific grazing systems. Also, a 50% use factor in grazing control will reduce the "forced" usage of some pastures as occurs under forms of rest rotation grazing.

e. Ephemeral Range

The three ephemeral allotments and ephemeral portions of other allotments will continue to be managed in accordance with the Ephemeral Range Special Rule, Title 43, CFR 4115.2-4.

f. Custodial Range

The management applied to the custodial allotments will have a significant positive impact on them in terms of controlling livestock numbers and over time improving their range condition. This will be in contrast to the status quo management that will continue under future trends.

g. Vegetative Manipulation

The chaining and burning actions as described in Chapter I will occur, with impacts as described in Chapter III-B5. In the development stages of the site-specific grazing systems, there will be the opportunity to select additional revegetation sites using site potential characteristics that evolve from the continuing monitoring actions.

h. Riparian Habitat

Riparian vegetation will improve with the overall improvement in range condition. Site-specific surveys of riparian habitats, habitat clearance of the 22 spring developments, and protection of these springs will be beneficial. Placement of troughs for livestock away from riparian spring sites will reduce adverse impacts that result from concentrated use at such sites.

6. Animals

On full implementation of this alternative, livestock grazing will be limited to 50% utilization of key forage species on all ES area allotments. This condition should ensure adequate forage and protective cover for all wildlife species, particularly within custodial allotments where projections of habitat quality are questionable under the proposed action.

Through the development of a monitoring program for the annual collection of additional biological data, a greater understanding of inhabiting wildlife species and their habitat requirements will be achieved. With such knowledge wildlife specialists and range management personnel will be able to form more environmentally acceptable grazing programs for specific allotments. For instance, during unproductive years, livestock numbers will be reduced to conform with the relatively low supply of forage plants. This will protect native herbivores and, indirectly, carnivores by reserving half of the available grasses, forbs, browse, and seeds for natural biotic processes. It is anticipated that the potential for occurrences of wildlife reproductive failure, starvation, and disease due to deteriorated range conditions will be permanently averted by this alternative.

a. Mammals

(1) Ungulates. The limited utilization of forage plants by livestock within ES area allotments (including those designated as custodial) will provide local mule deer, pronghorn, and desert bighorn populations with increased reserves of palatable vegetation and protective cover, relative to the proposed action. This will promote higher fawn and lamb survival rates. Annual adjustments in stocking levels, combined with the development of wildlife monitoring programs, may result in ungulate carrying capacities which exceed the potential ES area mule deer, pronghorn, and desert bighorn population sizes established for the proposed action.

(2) Carnivores. The relatively swift regeneration of native ungulate habitat will have a long-term beneficial impact on ES area mountain lion populations. The anticipated increase in lion prey resources, combined with improved vegetative cover, could significantly improve the quality of local mountain lion habitat.

The effects of this alternative on local coyote, gray fox, kit fox, ringtail, and badger populations are uncertain.

(3) Small Mammals. With implementation of this alternative, rodent and jackrabbit densities will decrease in direct relation to the improvement of ES area rangelands. In contrast, cottontail rabbit populations will increase as range conditions within individual allotments improve.

b. Wild Horses and Burros

BLM management objectives for wild horses and burros will be the same as those of the proposed action (see Chapter I) and will be managed in accord with the program described in Chapter IV-A3.

c. Birds

(1) Upland Game. The increased availability of protective cover and forage (grass, seeds, and succulent forbs) with the implementation of this alternative could promote higher carrying capacities and, therefore, increased levels of reproductive success for ES area mourning dove, white-winged dove, and Gambel's quail populations. The maintenance of high-quality dove and quail habitat will take place through the development of wildlife monitoring programs and annual adjustments in allotment stocking levels.

(2) Raptors. ES area raptors will benefit from the increased densities of game birds, perching birds, cottontail rabbits, amphibians, and reptiles. However, the anticipated decline in rodent densities could reduce the prey base for several ES area raptors (particularly owls). Overall, this alternative will have a beneficial impact on ES area raptors.

(3) Aquatic. Site-specific grazing systems will have no effect on ES area waterfowl.

(4) Nongame. Small nongame birds, including fox sparrows, nighthawks, poorwills, horned larks, meadowlarks, and Wilson's warblers, will also benefit from the increased abundance of forage and cover. In addition, lower numbers of livestock within ES area allotments will further reduce the potential for nest damage and egg breakage from livestock grazing and trampling activities.

d. Amphibians

During years of drought, stocking rates will be reduced in relation to the condition of allotment rangelands and the availability of forage plants. Unlike the proposed action, this alternative will reduce the potential for overgrazing during periods of environmental stress and will, therefore, ensure adequate reserves of green vegetation and plant litter. The protection of this material will enhance the moisture-retaining properties of ES area soils, which will in turn promote the quality of local amphibian habitats. In addition, lower stocking levels during dry years will reduce the demand for livestock water from regional springs, which usually produce less during dry seasons. Such adjustments in stocking levels will help preserve the quality of ES area amphibian habitats.

e. Reptiles

The anticipated increase in the abundance of protective cover and palatable forage plants (relative to the proposed action) will improve habitat conditions for local herbivorous reptile species. Carnivorous reptiles will benefit from the expected increase in amphibian, perching bird, and game bird densities. However, the reduction in rodent populations could have a negative impact on several ES area snake species, including western diamondback rattlesnakes, gopher snakes, and king snakes. Overall, this alternative will be expected to promote plant successions which favor more natural habitat conditions for ES area reptiles.

f. Invertebrates

The anticipated improvement in vegetative conditions will promote more natural habitat conditions for local invertebrate communities. In general, this will result in lower densities of most ES area arthropod species.

g. Threatened and Endangered

The improved vegetative vigor and diversity resulting from implementation of this alternative will enhance the quality of ES area desert tortoise habitat by providing an increased abundance of palatable forage plants and protective cover. Gila monster populations will also benefit, since the increased densities of perching birds, smaller lizards, and game birds will provide this reptile with additional forage resources.

Local zone-tailed hawk populations will benefit from the greater abundance of amphibians, reptiles, and cottontail rabbits.

h. Riparian

The impacts of this alternative on ES area riparian habitat will be the same as those resulting from the proposed action (see Chapter III-B6) and imposition of the same mitigating and monitoring actions (as described in Chapter IV) will be necessary.

7. Land Use

a. Land Use Characteristics

Under this alternative, ranching operations will occupy the same acreages as at present and will not differ significantly from future trends. Actual livestock use patterns will change gradually because grazing systems will be worked out on a site-specific basis as additional range information becomes available.

The use of land for subdivision purposes will not be changed noticeably in relation to future trends. Similarly, there will be no change in lands used for rights-of-way. Acreages scheduled for disposal and exchange under MFP decisions (Chapter I) are expected to remain in their current use category.

b. Recreational

Recreational land uses and future demand are expected to be as described in Chapter II-B7 and unchanged by this alternative. The impacts will be as described in Chapter III-B7.

c. Agricultural and Forest Products

The use of and impacts on ES lands for agriculture and forest products will remain as described in Chapters II-B7 and III-B7.

d. Livestock Grazing

The current and future trend in land use for grazing will be unchanged. However, there will be some changes in use patterns and seasons of use as the deferred grazing system is implemented.

The present pattern of cattle shipments and sales will persist although exact numbers will vary depending on market conditions. Cattle weights in the short term will be about the same and increase by about 10% over time as compared with a 5% decrease under current trends. Cattle prices will continue to follow historical patterns.

Cow/calf operations will continue as in the past but with the opportunity to increase efficiency from 65% to 85% with improved range condition and judicious culling of the herd at the initial sale period. This alternative also allows for a graduated implementation of the deferred management system on a site-specific basis.

e. Minerals

No short- or long-term change in mineral land use is expected under this alternative.

f. Transportation

Implementation of this alternative will not affect transportation-related land use or development.

8. Natural Hazards

This alternative will have little or no effect on flood hazards although the increase in plant density will have the potential to reduce surface runoff flows. The potential for flooding as identified for each allotment in Table II-5 will not change.

The fire hazard will increase with the increase in grasses and vegetative cover as contrasted to future trends. This vegetative improvement, however, will reduce the incidence and intensity of dust storms in the long term, although to what extent is not predictable.

9. Cultural Resources

Trampling of cultural resources will continue but at a lesser rate than at present and under future trends. With a 50% utilization factor there will be a positive increase in vegetational improvement over present and future trend conditions and in consequence, erosional impacts will be less than at present. Recreational and range improvement impacts will be similar to those described in Chapter III-B9.

10. Natural Environmental Areas

With a reduction of cattle to 6589 cyls and 50% forage utilization, the grazing pressures on the natural environmental areas will be moderately reduced relative to present conditions and future trends. The extent to which the quality of these identified areas (see Chapter II-B10 and Table II-55) is maintained will depend on the protective measures that the BLM develops in the future. Burros will continue to pose a problem unless management objectives are attained.

Only 11 new spring developments will be constructed resulting in minor impacts as described in Chapter III-B10, and thus limiting the possible impacts of soil and habitat disturbance and the potential for ORV access. The four scenic areas are not expected to be affected by this alternative.

11. Visual Resources

The existing visual characteristics of the landscape will not change under this alternative. The scenic quality and visual sensitivity levels as described in Chapter II-B11 will be marginally benefited in time as the result of the long-term improvement in range conditions. The VRM classification, however, will not be changed.

12. Socioeconomic Conditions

a. Demographic Characteristics

There will be no change from the characteristics as described for future trends, Chapter II-C12.

b. Employment

There will be no change from the characteristics as described for future trends, Chapter II-C12.

c. Income

There will be no change from the characteristics as described for future trends, Chapter II-C12.

d. Livestock Grazing Activities

(1) Ranch Characteristics. This alternative will have little or no effect upon the present ranch numbers, size, or ownership patterns.

Stocking at the estimated grazing capacity of 6589 cyls will result in a reduction of 1034 cyls or 13.57% from the current allowable level. This level will be maintained throughout the long term.

Management of the eight custodial allotments will change dramatically as they are brought under "controlled" management at a level of 50% utilization. Initial stocking levels will remain at 900 cyls until current estimated grazing capacities and range improvements are determined.

The improvements that would be constructed for the eight custodial allotments would be in addition to those proposed for this alternative.

(2) Cattle Shipments, Market Characteristics, and Sales. Under this alternative the pattern of cattle sales and shipments will not change from current conditions. Cattle numbers will vary with market factors and cattle weight will increase by 10% as compared to a 5% reduction under existing trends. Cattle prices will still follow the 10-year volatile cycle typical of the industry.

(3) Herd Inventory Value and Composition. At a stocking rate of 6589 cyls, the herd value will be $1.7 million initially as shown in Table VIII-4 and $1.78 million in the long term, compared with $1.92 million under current trends. There will be 1450 sale cattle valued at $284,000 ultimately, compared with 1677 sale cattle at $267,200. With the initial sale of cattle the rancher will realize $270,000 in capital gains.

(4) Ranch Value. The estimated value of the ranch will decrease to $6.85 million initially and increase to $7.15 million in the long term due to the increase in cattle weights. At this later time the land will be valued at $3.3 million, improvements at $1.61 million, cattle at $1.78 million, and machinery at $460,000.

(5) Economic Operations of the Ranch. The receipts for an average ranch under this alternative in the long term are estimated to be $1,310 with a 65% calf crop, compared to a loss of $2,700 under existing trends. With a 85% calf crop, the profit could increase to $10,220 annually as shown in Table VIII-5.

TABLE VIII-4

TOTAL HERD COMPOSITION AND INVENTORY VALUE - ALTERNATIVE B,
INITIAL STOCKING RATE 6,589 CYLS

| Herd Composition | Cyl | Price per Pound | Initial Weight (lbs) | Value | Potential Weight (lbs) | Value |
|---|---|---|---|---|---|---|
| 50% Producing Cows | 3,295 | 22¢ | 1,000 | $ 724,900 | 1,000[a] | $ 724,900 |
| 20% Replacement Heifers | 1,318 | 37¢ | 600 | 292,600 | 660[a] | 321,900 |
| 5% Bulls | 328 | $400 each | | 131,200 | - | 131,200 |
| 3% Horses, Milk Cows | 198 | $300 each | | 59,400 | - | 59,400 |
| 11% Steers (sale type) | 725 | 40¢ | 520 | 150,800 | 575[a] | 166,800 |
| 8% Heifers (sale type) | 527 | 34¢ | 435 | 77,900 | 479[a] | 85,800 |
| 3% Cull Cows | 198 | 20¢ | 800 | 31,700 | 800 | 31,700 |
| Subtotal | 6,589[b] | | | $1,468,500 | | $1,521,700 |
| 50% Heifers[c] | 873 | 40¢ | 300 | $ 104,800 | 330[a] | $ 115,200 |
| 50% Steers[c] | 873 | 48¢ | 300 | 125,700 | 330[a] | 138,300 |
| Subtotal | 1,746 | | | $ 230,500 | | $ 253,500 |
| Total | 8,235 | | | $1,699,000 | | $1,775,200 |

a. 10% increase in weight.
b. Includes cyls for custodial lands within 23 allotments.
c. Calves one day old to yearlings based on 65% calf crop for producing cost and replacement heifers less sale-type steers and heifers.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

TABLE VIII-5

AVERAGE RANCH EXPENSES AND RECEIPTS – ALTERNATIVE B, INITIAL STOCKING RATE 6,589 CYLS

| Expense Item | Percent of Total Expense | O&M* Costs |
|---|---|---|
| Overhead | 23.2% | $ 6,640 |
| Labor | 15.3 | 4,380 |
| Machinery | 20.5 | 5,860 |
| Materials | 12.3 | 3,520 |
| Custom Services | 1.5 | 430 |
| Interest | 9.0 | 2,570 |
| Depreciation | 18.2 | 5,200 |
| Total | 100.0% | $28,600 |

| Herd Composition | 65% Calf Crop | 85% Calf Crop |
|---|---|---|
| Cows | 243 | 243 |
| Replacement Heifers | 29 | 29 |
| Bulls | 14 | 14 |
| Market Steers | 80 | 103 |
| Market Heifers | 51 | 74 |
| Cull Cows | 24 | 24 |

| Receipts | Weight (lbs) | Price per Pound | Number of Head | Receipts | Number of Head | Receipts |
|---|---|---|---|---|---|---|
| Cows (cull) | 800 | $0.20 | 24 | $ 3,840 | 24 | $ 3,840 |
| Bulls | 1,100 | 0.30 | 2 | 660 | 2 | 660 |
| Steers | 575** | 0.34 | 80 | 15,640 | 103 | 20,140 |
| Heifers | 479** | 0.40 | 51 | 9,770 | 74 | 14,180 |
| Total Receipts | | | | $29,910 | | $38,820 |
| Total Expenses | | | | 28,600 | | 28,600 |
| Total Profit | | | | $ 1,310 | | $10,220 |

*286 cyls with $100/cow unit O&M, 1977 dollars.
**10% increase in weight.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

(6) Indirect Economic Effects of Ranching. The initial and long-term impact of this alternative will be a loss of approximately five jobs in ranching. Total direct net employment will increase by eight jobs to about 41 jobs. The total net income will be $99,500 above existing trends due to the increase in BLM staff salaries and related indirect and induced effects.

e. Government Revenues

Under this alternative, 54,100 AUMs* are estimated to be on Federal lands, resulting in grazing income from these units of $81,700 or a reduction in Federal grazing revenues of $12,800.

The revenues to the state will not change appreciably from the current level of $6,000-7,000.

The assessed valuation of the ranches initially will decline to $1.23 million and the tax returns will be $98,600 based on $8 per $100 of assess valuation. In the long term this will increase to $1.29 million valuation and $102,900 in tax revenues. The existing trend by comparison will result in $1.34 million in valuation and revenues of $107,000.

f. Support Facilities and Services

Under this alternative there will be no appreciable change in existing facilities and services.

g. Social Well-being

The life-style and values of the ranch community are not expected to change significantly under this alternative. While the initial adjustment period will be difficult and engender some antagonism toward the BLM, this will be moderated by a small sale of herd. Furthermore, the rancher will be able to maintain a constant herd level and, with improved range condition and the opportunity to increase cattle weights and herd efficiency, to realize an increased profit in the long term. The introduction of a deferred grazing system on a graduated basis will tend to lessen BLM-rancher disagreements.

13. Institutions

Institutional relationships will be comparable to the existing conditions initially. In the long term, however, the BLM will become involved in a more intensive management system and require the addition of three-to-five personnel. In addition, the BLM will incur a cost of $1.69 million for the construction of improvements on public and private lands. The initial outlay will be $470,000 for the mitigating and monitoring actions. The $1.22 million over the long term will be for the construction of all physical improvements.

Interagency agreements between the BLM and other agencies are expected to remain in force. With more intensive management it is expected that a stronger cooperative relationship will develop between the BLM and the State Land and Game and Fish departments.

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*68.4% of current allowable AUMs are on Federal lands.

## C. LIMITED ACTION

### Description

The limited action alternative retains the present level of allotment management within the ES area. The basic assumptions of this alternative are as follows:

- The current yearlong grazing programs will be continued on 20 perennial allotments and eight custodial allotments. The current instituted deferred grazing systems on three perennial allotments (Music Mountain, Crozier Canyon, and Upper Music) will also be continued.

- Authorized stocking rates will be in relation to current estimated grazing capacity which is based on information gathered from the 1976-77 BLM resource inventory. Therefore, the stocking rate will be reduced from 7623 cyls to 6020 cyls.

- The three ephemerally designated allotments plus the ephemeral portions of Big Ranch, Diamond Bar/Gold Basin, and Ft. McEwen will continue to be managed in accordance with the Ephemeral Range Special Rule, Title 43, CFR 4115.2-4.

- New range improvements will be authorized to meet a custodial level of management which will include the construction and maintenance of boundary fencing and the replacement and maintenance of water supply.

- There will not be any new range improvements to initiate any formalized grazing systems.

- Mitigating measures for burro control, cultural resources, and monitoring actions only as described in Chapter IV will be instituted.

- Wild horse and burro management objectives will be 14 and 145 animals, respectively.

- Easements and permits will be handled as at present.

### Analysis

#### 1. Air Quality

Taking into account some range deterioration and minor dirt road traffic increases, a 10% increase in particulate emissions for the ES area will occur over the next 15-20 years. While the higher mean annual particulate level of 51 $\mu g/m^3$ is still under the state standard, the violations of the state 24-hour standard will increase from 7 to 12 days per year.

The particulate emissions will increase to nearly 545,000 tons per year, about 50,000 tons per year over present conditions. The valley areas (13 AMP and 6 custodial allotments*) are expected to be more severely affected than the hill and mountain areas. Total wind erosion emissions in the valley areas will be nearly 435,000 tons per year, or about 40,000 tons more than at present but only slightly under existing trends.

2. Geology and Topography

The geological and topographical character of the area is not anticipated to change significantly or noticeably, and there will be no effects on paleontology.

3. Soils

The present condition of the soils is fairly stable and the erosion hazard is categorized as low to very low. The soil conditions are, therefore, expected to remain at about 686 acre-feet per year, or about 69 acre-feet less than future trends. However, in certain localized areas of some allotments erosion effects may be accelerated. Most of this continued damage will occur in areas of overgrazing and sparse ground cover, particularly near drainage channels and stock tanks and in those allotments characterized by an apparent downward trend: Cane Springs, Castle Rock, CQT, Ft. McEwen, Mineral Park, Music Mountain, and Upper Music, as well as the custodial lands.

4. Water Resources

The water quality of the area is not expected to change significantly under this alternative. Some localized minor water pollution will occur at water supply sites depending on cattle numbers and length of stay. However, because of lack of data, these conditions are not quantifiable. Similarly, water resource use will be approximately the same as now since no new water resources will be constructed.

5. Vegetation

a. General Description and Phenology

Continuation of the existent management systems on all allotments at the reduced stocking level of 6020 cyls will allow for a "pause" in the degree of pressure that the foragable species will continue to receive. As the present livestock grazing systems are not related to seasonal growth periods or the phenological development stages of the primary forage species (except perhaps the Music Mountain, Crozier Canyon, and Upper Music allotments which are under a form of deferred grazing), the long-term impacts of this alternative will be a continued degradation of the total plant community.

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*Part of full allotment numbers: 7A, 10A, 15A, 17A, 19A, 20A, 27A, 29A, 30A, 34A, 42A, 56A, 71A, 24C, 32C, 48C, 59C, 74C, and 77C.

b. Vegetative Conditions of the Range

Information compiled on present range condition and apparent trend indicates that under present management there is a general decline in range condition within the total ES area. This is a cumulative condition including historical overstocking and improper livestock and resource management in more recent history. The present apparent trend is not quantifiable as there is no long-term vegetative trend data which can be used as a reference base to equate actual trend. On the basis of apparent trend, 5 of the 23 perennial base allotments show a stable to upward trend, 8 are down, with the remaining 10 designated as not apparent. Of these 10, several appear to be downward on the basis of percentages of acreage in the poor to fair categories.

In general under this alternative the opportunity to improve the range condition and forage production of most allotments will be lacking. Over time, therefore, the range will continue to deteriorate and ultimately livestock numbers will of necessity be drastically reduced. The riparian habitats and threatened and endangered plants will similarly suffer as there will be no incentive through intensive management to fence in or protect such environments.

c. Threatened and Endangered Plants

The condition of the threatened and endangered plants will reflect the condition of the range as a whole. Under this alternative, it is expected that the threatened and endangered plants will slowly and gradually decline, although this cannot be measured in detail as specific trend data is lacking.

d. Poisonous Plants

In general, without the proposed action those allotments presently in relatively poor-fair condition and expressing an apparent trend designation of down or not apparent could have an increase in toxic plants. The types of poisonous plants that would increase are those of an annual nature (careless weed, Russian thistle, cocklebur, <u>Solanum</u> species, etc.), and such half-shrubs as snakeweed and <u>Aplopappus</u> species. Combined with the potential for less available range forage, the opportunity for the incidence of animal poisoning would be increased.

e. Ephemeral Range

As the ephemeral ranges are used only occasionally as forage conditions permit, the opportunity for a marginal decline in the relative condition of the ephemeral range exists. This decline is not quantifiable as no data exists for forecasting trends.

f. Custodial Range

The consequence of continued custodial management without the introduction of range improvement practices and no indication of a reduction in livestock numbers will be a continued decline in range condition. This cannot be quantified at this time.

On the seven AMP allotments containing various proportions of custodial lands, continued use without the proposed action will result in a continuing decline in range condition. This will be particularly true on those allotments where livestock numbers are not controlled -- Castle Rock, Canyon Ranch, and Ft. McEwen. The same opportunity for a decline in range condition exists on those allotments where fencing does not separate the custodial from the management portions of the allotments -- Black Mountain, Castle Rock, and Canyon Ranch. The lack of a physical separation between custodial and management units on the same allotment can allow for an intermingling of controlled and uncontrolled livestock which is not conducive to proper use of the allotment.

g. Vegetative Manipulation

As management decisions relative to range improvements will be made upon the basis of a custodial level of management, there will be no vegetative manipulation on the Truxton Canyon and Mt. Tipton allotments, nor will other candidate sites for vegetative manipulation be designated.

h. Riparian

The riparian sites will be impacted to an even greater degree than under present grazing as water sites per se will receive minimal maintenance under the custodial level of management representative of this alternative.

6. Animals

As the ES area has been heavily utilized by domestic livestock for several decades, most of the wildlife resources have probably stabilized at low densities and diversities. However, many native organisms are extremely sensitive to intense livestock grazing and will probably continue their gradual population decline until they cease to exist within the ES area. The reduction in livestock numbers will partially offset this decline.

a. Mammals

(1) Ungulates. Mule deer populations will continue on a declining trend because of habitat loss from persistent livestock grazing.

Desert bighorn populations could also be negatively impacted due to habitat disturbance from increasing burro populations of the ES area.

(2) Carnivores. The continued decline in local mule deer populations will be reflected by diminishing numbers of ES area mountain lions. The impact of this alternative on the remaining species of ES area carnivores is uncertain.

(3) Small Mammals. Rodent and jackrabbit densities will remain relatively high within the ES area, while potential cottontail rabbit densities will continue to be suppressed by persistent and heavy livestock grazing.

b. Wild Horses and Burros

Range management programs for wild horses and burros will be the same as those outlined in mitigating measures, Chapter IV-A3.

c. Birds

(1) Upland Game. Upland game birds will not change significantly in population sizes and distributions since their numbers have remained relatively stable through many years of heavy livestock grazing.

(2) Raptors. Although pre-grazing density data are unavailable, predatory birds, including golden eagles, zone-tailed hawks, red-tailed hawks, screech owls, great horned owls, and prairie falcons, will probably continue to inhabit the region but will be prevented from achieving their natural abundances.

(3) Aquatic. Waterfowl will be unaffected by continuing the present livestock grazing practices. Shorebirds and anseriforms only utilize ES area water sources as resting sites during migrations and are unaffected by the area's range conditions.

(4) Nongame. As with upland game birds, perching bird populations will not change significantly. Most species of ES area perching birds appear to have adapted to local range conditions and have stabilized at relatively low population densities.

d. Amphibians

Frogs, toads, and salamanders will be subjected to a continuation of deteriorated habitat conditions (particularly within riparian areas), which could result in reductions of ES area amphibian diversity.

e. Reptiles

Reptile populations will remain stable at best, with several species continuing a downward trend in numbers due to direct competition with livestock for food, and due to reduction of cover by livestock grazing. Reptiles likely to continue population declines include the desert tortoise and Gila monster. Other vulnerable species include the desert rosy boa, Arizona night lizard, and Great Plains skink.

f. Invertebrates

Under this alternative, ES area invertebrate populations will remain at relatively low diversities, with high densities among grazing-resistant species.

g. Threatened and Endangered

Information concerning peregrine falcon and bald eagle (if present) habitat requirements and population trends within the ES area is lacking. Therefore, the future effect of continued livestock grazing on these raptors is unknown.

Local Gila monster and desert tortoise populations will probably continue in a declining trend, eventually resulting in the localized extinction of these two reptiles.

The habitat quality of zone-tailed hawks will also continue to degenerate since local riparian areas will be persistently overgrazed.

h. Riparian Habitat

The impacts of this alternative on ES area riparian animals will be the same as those outlined under future conditions.

7. Land Use

a. Land Use Characteristics

The principal land use within the study area -- grazing -- is expected to remain in the same relative acreage as present. The checkerboard pattern, however, may change to some extent as the several parties involved -- the BLM, State Land Department, private landowners, and local or other government interests -- have indicated a strong desire to continue to dispose of or exchange lands. The exchanges are not expected to diminish the presence of the BLM in the management of public lands for multiple-use purposes or alter grazing land uses.

In relation to urban subdivision or expansion, the County Planning and Zoning Commission estimates that only 8.3% of the existing undeveloped acreage will be needed in the future. This use will require only an additional 20 square miles of land out of the 402 square miles currently subdivided, which includes the 13.4 square miles already in use. Other land uses for rights-of-way, etc., are not expected to increase appreciably.

Mohave County's current effort to effect land use controls will probably be successful. Most of these controls, however, will be directed toward urban growth, particularly in Kingman and the several developments along the Colorado River.

The county's attempt to diversify its economic base will continue. This will probably result in industrial, tourism, and service activity increases in the urbanized areas of Kingman and Bullhead City. These developments will not involve the use of public grazing lands unless unpredictable land exchanges occur.

b. Recreational

A definitive conclusion on recreational uses cannot be made without a comprehensive evaluation of recreational demand. The BLM forecast of a 20% increase in recreational use therefore is considered questionable. Certainly the probable deterioration in range condition will lessen the attractiveness of the study area for recreational purposes. The recreational uses of the land are expected to remain as currently designated.

c. Agriculture and Forest Products

Agriculture and forest products development are not major land uses in the ES area. Therefore, neither can be considered a potential, major land user in terms of future growth or competing activities.

d. Livestock Grazing

The present livestock management practices (herds of cattle, cow/calf operations, breeding practices, seasons of use, shipping dates, culling practices, etc.) will remain unchanged and the land use patterns will be essentially the same. The continuance of these present use patterns, combined with the varied precipitation patterns of the past 30 years, can only add to a general decline in the range trend. This situation, as well as the continued rise in the costs of ranching, could result in the smaller ranches ceasing to operate. This change will not necessarily alter the land use as these smaller allotments (those will less than 100 AUMs or eight allotments) may consolidate with adjacent landowners or retain the land without livestock grazing.

e. Mineral Resources

The minerals of the ES area have been and will continue to be explored, developed, and extracted. The possibility of these developments depends on worldwide economic conditions and has little or no relation to this alternative. The areas from which these minerals could be extracted are generally not usable grazing lands except in the case of some sand and gravel operations. The latter activity would entail at the most 10-15 acres and would be located at the fringes of the grazing areas. Salt mining at Red Lake would not interfere with cattle grazing.

f. Transportation

The improvement of the transportation network in Mohave County over the next 15 years will probably be in accord with the proposal of the County Planning and Zoning Commission. These improvements will be primarily directed toward maintaining and upgrading existing roads and will not be affected by this alternative.

8. Natural Hazards

The potential for natural hazards to increase will relate directly to condition of the range. The flooding potential will probably be greater as there will be less vegetative cover, allowing for increased runoff and wider dispersal of sheetfloods. The magnitude and occurrence of floods, however, are derivative of rainfall intensity, duration, and location which vary considerably above and below a mean of 9-10 inches annually. The extent of increased flood hazard, therefore, cannot be accurately predicted.

The fire hazard will not change significantly and, as in the past, will generally occur along the highways. The present condition is not considered severe and with a continued degradation of the rangeland the hazard will be somewhat lessened. While reduced vegetation will lower the fire hazard, the potential for dust storms will increase, particularly in the 13 allotments in the valley areas.

9. Cultural Resources

Artifact damage will continue to occur from the trampling actions of cattle, although less frequently and extensively than in the past. This nonrenewable resource will also be adversely affected by further deterioration of the range condition, particularly from the effects of erosion.

10. Natural Environmental Areas

The principal effect on the natural areas will be the further deterioration of the qualities that would characterize such areas. While this cannot be readily quantified in the absence of specific criteria and methodologies, the pressure for forage utilization throughout all areas will continue, even with fewer cattle. Moreover, the lack of an intensive management plan will reduce the instrument through which the MFP decisions (Table I-14) could be implemented and the environment protected. This adverse effect will be most evident in the Black Mountain (Mt. Nutt area) and Ft. McEwen (Willow Springs area) allotments.

11. Visual Resources

The visual character of the existing landscape will remain the same without the proposed action. The mountains, valleys, steep cliffs, and canyons with sparse vegetation will still be readily visible and continue to give the area its remote, natural quality.

Even with a reduced stocking rate, a gradual decrease in vegetative cover will occur. This change, along with wind erosion, will modify the texture, form, and color of the existing landscape. The scenic quality evaluation ratings for the valley areas in particular will drop and lower the scenic quality to class C and the VRM classification from IV to V, even without the construction of new improvements. Visual sensitivity levels, however, are not expected to change.

12. Socioeconomic Conditions

a. Demographic Characteristics

The population projections for Mohave County are expected to be as shown in Table II-73 and discussed in Chapter II-C. Neither this alternative nor livestock grazing in particular is expected to affect the trends in any noticeable way. The makeup of this population will follow the trends established in the 1960-75 period, with older and younger age groups predominating and no significant increases in minorities. No change is anticipated in the size or characteristics of the ranch community.

b. Employment

The employment projections associated with the population projections made by OEPAD for Mohave County will be unchanged. Agriculture will continue to be the only sector in which employment will decrease in both the state and in Mohave County. The growth and employment in the service sectors, including wholesale and retail trade, finance, insurance, real estate, and personal services, will stem both from increases in tourism activity as Mohave County attracts more destination and pass-through visitors, and from serving the increasing retired population. Ranch operations will continue to contribute very little to basic employment and will represent an even smaller segment of the economy.

c. Income

Total personal income in Mohave County in 1972 dollars will increase from $150 million in 1976 to $289 million by 1990, an increase of 93% over 14 years. However, despite the fact that population in the county will increase at approximately the same rate as the state's total population, the rate of growth of personal income in the county -- 4.8% -- will be somewhat less than the growth of income statewide -- 5.1%.

The total net income derived from ranching and induced and indirect effects is not expected to vary from existing trends.

d. Livestock Grazing Activities

(1) Ranch Characteristics. The total number of ranches in the ES area will remain the same with this alternative. The cyls will be reduced from 7623 to 6020, including custodial use areas, because of the general range condition. The eight custodially managed units and the three ephemeral allotments will not change.

The small ranch units (less than 400 cyls) will still subsidize their operation with other sources of income and the rancher will adhere to ranching as "a way of life." Essentially, the rancher will continue to operate as described in Chapter II-B12, the only differences being smaller herds, a range resource in slightly poorer condition than at present, and no new range improvements or associated costs.

(2) Cattle Shipments, Market Characteristics, and Sales. The present pattern of cattle shipments and sales for Mohave County (Chapter II-B12) will not change significantly, although gross cattle shipments will be less because of the reduction in cyls. Because forage production is not expected to improve, cattle weights are expected to decline by 5% to 425 to 525 pounds for steers and 380 to 425 pounds for heifers.

Cattle prices will continue to follow the 10-year cycle typical of the past, ranging from an average of $27-58 per hundredweight.

(3) Herd Inventory Value and Composition. Assuming an initial stocking of 5120 cyls plus 900 cyls for custodial lands, the total ES area herd composition and value will be $1.52 million as shown in Table VIII-6. There will be 1324 sale cattle valued at $227,300 at an average price of $172 per head. In comparison, the total herd composition and value under existing trends is 7623 cyls and $1.92 million.

(4) Ranch Value. The estimated value of the ranches in the ES area will decrease in keeping with the reduction in cyls from 7623 to 6020. At this level, the ranch will be valued at $6.41 million compared to $7.47 million, with the land value estimated to be $2.82 million, improvements $1.61 million, cattle $1.52 million, and machinery $460,000. The ranchers, however, will realize a cash value of $450,000 from the sale of cattle.

(5) Economic Operations of the Ranch. The average size ranch in the ES area is expected to incur an annual operating loss of $2,330 under this alternative. This is based on 262 cyls,* $100 O&M costs/cow unit, and a 65% calf crop as shown in Table VIII-7. Four of the permittees will have more than 300 cyls, three are in the 200-300 cyl range, and 11 are in the 0-200 cyl range. The average ranch size under existing trends, as discussed previously in Chapter II-B12, had 331 cyls and showed a loss of $2,700. It can be seen, therefore, that the operational position of these ranchers will at best remain the same and more likely decline.

(6) Indirect Economic Effects of Ranching. The decrease in ranch-related employment will range from 10-12 persons depending on the O&M costs of the ranches. The largest loss, eight persons, will be in direct employment on the ranch due to the reduction in cyls. The total induced income in this period will be a net loss of $52,900.

e. Government Revenues

Based on the current fees of $1.51 per AUM, and the stocking rate of 49,400** AUMs, the revenue from grazing fees in the ES area will be $74,600, or $19,900 less than existing trends. Under the new BLM rules, the amount available in the ES area for range improvements will be $12,400 as opposed to $23,600.

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*6020 cyls divided by 23 allotments.

**Allowable AUMs on Federal lands based on the same ratio as current allowable AUMs.

TABLE VIII-6

HERD COMPOSITION AND INVENTORY VALUE - ALTERNATIVE C, STOCKING RATE 6,020 CYLS

| Herd Composition | Cyl | Price per Pound | Weight (lbs) | Value |
|---|---|---|---|---|
| 50% Producing Cows | 3,010 | 22¢ | 1,000 | $ 662,200 |
| 20% Replacement Heifers | 1,204 | 37¢ | 570[a] | 253,900 |
| 5% Bulls | 301 | $400 each | | 120,400 |
| 3% Horses, Milk Cows | 181 | $300 each | | 54,300 |
| 11% Steers (sale type) | 662 | 40¢ | 494[a] | 130,800 |
| 8% Heifers (sale type) | 481 | 34¢ | 413[a] | 67,500 |
| 3% Cull Cows | 181 | 20¢ | 800 | 29,000 |
| Subtotal | 6,020[b] | | | $1,318,100 |
| 50% Heifers[c] | 798 | 40¢ | 285[a] | 91,000 |
| 50% Steers[c] | 798 | 48¢ | 285[a] | 109,200 |
| Subtotal | 1,596 | | | $ 200,200 |
| Total | 7,616 | | | $1,518,300 |

a. Lightweight calves typically are priced higher per pound than older animals.
b. Includes cyls for custodial lands within 23 allotments.
c. Calves one day old to yearlings based on 65% calf crop for producing cows and replacement heifers less sale-type steers and heifers.

Sources: Arthur D. Little, Inc., estimates; American Ag International; estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

TABLE VIII-7

AVERAGE RANCH EXPENSES AND RECEIPTS - ALTERNATIVE C, STOCKING RATE 6,020 CYLS

| Expense Item | Percent of Total O&M Budget | O&M Costs* |
|---|---|---|
| Overhead | 23.2% | $ 6,080 |
| Labor | 15.3 | 4,010 |
| Machinery | 20.5 | 5,370 |
| Material | 12.3 | 3,220 |
| Custom Services | 1.5 | 390 |
| Interest | 9.0 | 2,360 |
| Depreciation | 18.2 | 4,770 |
| Total | 100.0% | $26,200 |

| Herd Composition | 65% Calf Crop |
|---|---|
| Cows | 223 |
| Replacement Heifers | 26 |
| Bulls | 13 |
| Market Steers | 72 |
| Market Heifers | 46 |
| Cull Cows | 22 |

| Receipts | Weight (lbs) | Price per Pound | Number of Head | Total Price |
|---|---|---|---|---|
| Cows (cull) | 800 | 20¢ | 22 | $ 3,520 |
| Bulls (cull) | 1,100 | 30¢ | 2 | 660 |
| Heifers | 413** | 40¢ | 46 | 7,600 |
| Steers | 494** | 34 | 72 | 12,090 |
| Total Receipts | | | | $23,870 |
| Total Ranch O&M | | | | $26,200 |
| Profit (Loss) | | | | $(2,330) |

*262 cyls with $100/cow unit O&M cost.
**5% loss in weight.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

The revenues to the state are expected to remain at about $6,000-7,000, assuming no land exchanges. While the rental rate is based on grazing use levels and carrying capacities that would point to a decrease, they also reflect market conditions which are difficult to predict accurately. Thus, the rates the state may set in the future are not determinable.

The assessed valuation of the ranches will decrease to $1.15 million (based on current rates) as compared to $1.34 million under existing trends. Similarly, taxes in terms of 1977 dollars will be about $92,300 per year, or $15,300 less than existing trends.

f. Support Facilities and Services

Rancher use of public services will continue to be minimal and have little effect on public support facilities and services. These facilities and services will continue to focus on the needs of the principal recipients or users -- namely, the residents of urbanized areas and the seasonal tourists.

The different levels of Federal, state, county, and city agencies providing public services within Mohave County will undertake modest expansion of staff, facilities, and equipment. The county will continue to bear the greater responsibility for the provision of local services. Special social services in the ES area will be developed in direct relation to the growth of specific groups, such as the retirement communities rather than the ranch community. The ranching community will continue to have little or no effect on these services and will generally remain independent of them.

g. Social Well-being

The growth of the tourism and recreational industry will determine the future of the shoreline communities, of Kingman, and generally of the ES area. The county will probably concentrate its planning and economic development efforts on the diversification of its economic base around the urban centers of Kingman, Bullhead City, and Katherine Landing and on the promotion of open spaces and their recreational potential. This may provide opportunities for those owners of private land in the Portland Spring and Thumb Butte vicinity to dispose of some properties for economic gain. The influence of the ranching community, however, on the county's development as a whole will continue to diminish in direct proportion to the growth in other economic sectors. Other residents will feel less and less the presence of the ranching community in their lives.

The increased costs of operating a ranch, as discussed above, may cause some of the marginal ranchers to end their grazing operations. Discussions with the ranchers indicated in most cases that under these conditions, they would stay on the land and maintain their life-style. Other sources of income may be sought (as is already done) but this would be done locally and would not involve any new skill, training, or education. Three of the ranchers indicated a willingness to sell but it cannot be assumed that this would occur.

There will be little or no change in the conservative values and life-style of the ranchers. They will continue to stay close to the land and focus on their own immediate concerns and ranch operations. Very few, if any, will sell their land as ranching as a way of life is more important than economic gain or seeking other options, skills, or places to live. While population and recreational use of public lands will increase, the rancher will be concerned only to the extent that vandalism occurs more frequently. In general, the rancher will remain uninvolved.

The conflicts with and the antagonism of the ranchers toward the BLM possibly will be as varied as in the past even though the pressure and intensity of management practices will be reduced. The initial reduction in cattle will engender strong feelings in the short term, certainly not changing present attitudes.

13. Institutions

Under this proposed alternative, the BLM will essentially continue to operate as it has in the past five-to-ten years. While the multiple-use policy will be maintained, it is expected that the implementation of this policy will proceed more slowly and that management plans will come into effect only gradually. The involvement of the BLM with the ranchers will persist although less intensely and extensively than at present.

The impact of this alternative on the BLM will be the same as described under future trends, Chapter II-C13, and the further deterioration of the range will pose a dilemma for the BLM.

The costs of range improvements and the need for additional BLM personnel, as identified in Chapter I, will be avoided under this alternative. The survey of range conditions, the determination of grazing capacities and AUMs, and the issuing of permits, etc., will still be accomplished. These activities will require a continued expenditure of public funds at approximately current levels aside from inflation. The level of related BLM resource management personnel is expected to remain stable.

The agreements between the BLM and other governmental institutions will still be in force. Most likely some of the issues and conflicts and attendant political pressures will diminish with the less intensive role of the BLM relative to land disposal, uncontrolled lands, grazing capacity determination, and the omnipotent presence of the Federal Government. With the state tending toward improved management of its lands, there will be greater agreement with the BLM on implementation methods. Land disposals and exchanges are also more likely to occur among the state, the BLM, and the private landowner.

## D. NO ACTION

### 1. Description

Under this alternative the present level of allotment management within the ES area will be continued. The basic assumptions of this alternative are as follows:

- The existing range management programs and practices will continue without the improvements and grazing practice changes called for in the proposed AMPs. The current yearlong grazing programs will be continued on 23 perennial allotments and eight custodial allotments. The existing deferred grazing systems on three perennial allotments (Music Mountain, Crozier Canyon, and Upper Music) will also continue.

- The three ephemerally designated allotments plus the ephemeral portions of Big Ranch, Diamond Bar/Gold Basin, and Ft. McEwen will continue to be managed in accordance with the Ephemeral Range Special Rule, Title 43, CFR 4115.2-4.

- The authorized stocking rates will not change in relation to current numbers -- i.e., 7623 cyls.

- No new range improvements will be authorized except as necessary to maintain existing facilities consistent with a custodial level of management.

- The wild horse and burro management objectives will be 14 and 145, respectively.

- Only the mitigating measure for burro control will be instituted.

- Easements and permits will be handled as at present.

### 2. Analysis

The characteristics and impacts of this alternative are expected to be the same as those described in Chapter II-C, the description of the future environment without the proposed action.

## E. REMOVAL OF LIVESTOCK GRAZING FROM PUBLIC LANDS

### Description

This alternative considers the removal of all livestock grazing on public lands within the ES area. It is based upon the following assumptions:

- Grazing permits for livestock use on public lands within the ES area, including the 23 allotments proposed for intensive management, the three allotments under the Ephemeral Range Special Rule, and the eight custodial units, will be eliminated.

- No new AMPs will be developed and thr three AMPs now being implemented will be terminated. Livestock grazing agreements with the NPS (Lake Mead National Recreational Area) will be canceled.

- There will be no new range improvements (fences, water, etc.) and existing improvements will not be maintained, except when designated by the BLM for other uses such as wildlife.

- In order to prevent livestock trespass on public lands, 4980 miles of fencing with appropriate cattleguards will need to be constructed.

- The BLM will continue to manage the public lands for all other multiple uses as mandated in the Federal Land Policy and Management Act of 1976.

- Wild horse and burros will be managed in relation to forage availability and competition with other wildlife after management objectives of 14 horses and 145 burros have been achieved.

- Easements and permits will be handled as at present.

- No mitigating actions will be instituted other than monitoring of the range and control of the burros.

### Analysis

#### 1. Air Quality

There will be a definite improvement in air quality in the ES area. Violations of the state standard will decrease to four or five days, mostly caused by sources outside the area. A concomitant reduction in dust storms will be the result of vegetative materials expanding in ground coverage; this in turn will result from improved total range condition and the absence of grazing livestock.

2. Geology and Topography

This characteristic of the ES area will not be affected as a result of the cessation of livestock grazing.

3. Soils

Absence of grazing will significantly reduce, but not entirely eliminate, the sediment yield of 755 acre-feet per year under existing trends. It is estimated that the loss will be 612 Aft per year.

Under this alternative, 4980 miles of Type A and some Type D fence will be constructed to exclude livestock grazing on public lands. The disturbance caused by construction will result in an average sediment yield of 0.28 Aft per square mile per year on approximately 9.4 square miles, or an increase of 2.6 Aft of sediment across the ES area. A potential doubling of this sediment yield during the year of construction and for an additional year afterward will result in an increase of approximately 10.5 Aft of sediment yield across the entire ES area.

4. Water Resources

Without the implementation of the AMPs, there will be no development of vertical and horizontal wells to provide additional water for livestock use; hence, the intended use of groundwater will be foregone. The effect basin-wide will be negligible.

It is doubtful that the elimination of livestock grazing will have a significant impact upon the annual water yield in the major drainages within the ES area, due to the erratic nature of the precipitation and the low erosion characteristics of the soils within the area.

5. Vegetation

a. General Description and Phenology

All plant communities will benefit from the removal of domestic livestock from the Federally-designated acreages. This lack of use will allow for a natural recovery of all foragable species through physiological rest and normal phenological development year after year. Any restrictions in the normal phenological development of plants in the future would be those that are naturally imposed such as by drought or survive temperatures

b. Vegetative Condition of the Range

The complete elimination of grazing will have a dramatic impact on those portions of the ES area with inherent potential for improved plant growth because of their soils, precipitation, and locational characteristics. In such areas there will be an increase in plant materials (grasses, forbs, and shrubs) in a successional pattern over time. Plant succession towards a climax will take many years during which time the plants that

were relished by grazing livestock will be initially favored. Improvements in range condition will occur on all areas as yearlong grazing is presently practiced over the entire ES area, with the exception of the three ephemeral allotments and ephemeral portions of other allotments. Range recovery will occur in relation to soil association components, present condition, and future precipitation patterns.

Those areas of grassland designation or shrub-grass disclimax communities which show the quickest response to non-use include the mid-elevation ranges on the eastern slopes of the Cerbats stretching across the Hualapai Valley and up the western slopes of the Music Mountains. An additional area of rapid response to non-use will be the grassland sites on the Crozier Canyon, Music Mountain, Upper Music, Clay Springs, and Diamond Bar/Gold Basin allotments that comprise the upper portions of the Music Mountain range.

Ranges displaying a present downward trend (Table II-9) could expect to stabilize within 5-10 years and then experience a gradual increase in range condition in the following 10-year period. Those allotments in a stable condition could anticipate a gain in a condition class of 10-15% of their total acreage within a 10-20 year period. The allotments exhibiting an upward trend under present management could anticipate a gain in one condition class for 20-30% of their total acreage within the same 10-20 year period.

c. Threatened and Endangered Plant Species

These species will benefit in the same manner as the entire plant community with the basic physiological needs of the plants fulfilled. The opportunity for them to regain vigor and produce in a normal manner will be increased. The opportunity to accumulate additional information about the location and phenology of these species will be reduced as there will be no monitoring program for this purpose with the elimination of grazing.

d. Poisonous Plants

In time, toxic plants will occupy their normal niche in the plant community as the impacts of livestock grazing are reduced. Some annual forms that habitually occupy disturbed areas will in time be reduced in numbers. Animal toxicity will occur at an undetectable level among the ungulate wildlife species and wild horses and burros.

e. Ephemeral Range

Without domestic livestock, the ephemeral ranges will not be subjected to periodic annual use. This non-use will benefit the perennial species that are grazed within the designated annual range, and will allow for the 100% development and disbursement of animal seed crops as growth conditions permit. Plant utilization within the ephemeral zones will be limited to native wildlife.

f. Custodial Range

The custodially designated allotments will benefit dramatically from the elimination of domestic livestock and in the same manner as the 23 perennially managed allotments as discussed under b above.

g. Vegetative Manipulation

Vegetative manipulation programs on Truxton Canyon and Mt. Tipton allotments will not occur under this alternative.

h. Riparian

Riparian vegetation and sites will benefit to the degree that domestic livestock use is reduced. Those sites that are utilized extensively by wildlife species, burros, and wild horses will continue to be impacted. Generally, riparian sites will improve from the present condition under this alternative.

6. Animals

The removal of domestic livestock from ES area public rangelands will eliminate all present and potential conflicts between cattle and local wildlife populations. However, the total elimination of livestock from such lands will not be expected to promote optimum wildlife habitat. The construction of fences around state and private lands will restrict the movements of native ungulate populations. Furthermore, the potential for death and/or injury to ES area wildlife from entanglement in the fences and severed flesh from barbed wire will increase.

In addition, many of the existing ES area springs and wells are located on state or private land. The anticipated loss of these water sources will have a devastating effect on local wildlife populations. Water sources which have been developed on public lands for livestock and wildlife will no longer be maintained by local ranchers. Since the BLM presently lacks adequate funding or personnel for the continued operation and maintenance of these springs, wells, pipelines, water troughs, and water storage tanks, Federally-owned water sources will probably degenerate and eventually be lost as sources of wildlife water. This condition, unless mitigated through a spring maintenance program, will threaten the present biotic structure of ES area wildlife communities.

a. Mammals

(1) Ungulates. The additional quantity of forage available to mule deer, bighorn sheep, and pronghorn is estimated at 43,560,960 pounds per year (derived from the estimated forage consumed at the initial stocking level for the proposed action). Although the desert bighorn sheep and pronghorn will benefit from the removal of livestock, mule deer will

realize more benefit than the other ungulates. The ES area mule deer population is generally low and has been declining for over a decade. This decline in density has been primarily attributed to habitat deterioration through overgrazing by livestock (see Chapter II-B6).

(2) Carnivores. Although definitive data are not available on ES area carnivore population density, diversity, and distribution, these predators are expected to benefit by this alternative. Removal of all domestic livestock will result in greater forage reserves for ES area herbivores. As the herbivore component increases in density in response to the increased food source, the predator densities will eventually respond in kind.

(3) Small Mammals. The effects of livestock grazing on the 41 species of small mammals that presently occur on the ES area is quite variable (Chapter II-B6). Thus, it is not possible to determine the overall effects of livestock removal on this environmental component, but preliminary investigations suggest that rodent densities tend to be lower under natural conditions than on overgrazed rangelands.*

b. Wild Horses and Burros

The stated BLM management objectives for wild horses and burros (Chapter I) will still apply. That is, the present horse population will be maintained or slightly increased while the burro herd will be reduced from 1825 animals to 145.

c. Birds

(1) Upland Game. The present overgrazed range condition, particularly near springs, has reduced the availability of protective cover and forage plants utilized by quail. Removal of livestock from the range will alleviate this condition and quail populations will increase.

(2) Raptors. As a result of past and present grazing practices, the raptor habitat has slightly decreased in quality and quantity. Removal of livestock will reverse this trend.

(3) Aquatic. Removal of livestock will have no effect on the aquatic birds of the ES area.

(4) Nongame. Information concerning the effects of livestock grazing on the nongame birds of the ES area is not available; however, in other areas (see Chapter II-B6) poor range conditions have been associated with a decline in avian populations. Removal of livestock from the ES area should result in improving the quality of the nongame bird habitat.

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*W.H. Conley, Effect of Rodents, Rabbits, and Cattle on Two Vegetation Types in Semi-desert Rangeland, New Mexico College of Agriculture Experiment Station Bulletin 353, 1950, pp. 1-23.

d. Amphibians

The present impact of livestock grazing on amphibians through destruction of riparian habitats around spring sites will be significantly reduced through implementation of the alternative. This is, however, contingent upon the institution of a program of spring maintenance as outlined above.

e. Reptiles

Removal of livestock from the ES area will improve the habitat condition for ES area reptiles on those allotments where the range condition is presently identified as poor.

f. Invertebrates

Information concerning the effects of livestock grazing on ES area invertebrates is not available; however, the habitat quality for this environmental component is expected to improve with removal of livestock.

g. Threatened and Endangered

The threatened and endangered species are not expected to change through implementation of this alternative.

h. Riparian

With the elimination of livestock grazing, ES area riparian habitat located on public lands will improve dramatically. The more delicate flora, such as maidenhair fern, columbine, and helleborine, will become reestablished within some riparian areas which had been heavily utilized by livestock. This condition, in conjunction with the increase of the more common riparian vegetation, will provide local riparian wildlife with increased forage and additional protective cover. Furthermore, temporary habitat disturbance from spring development activities (as outlined in the proposed action) will not occur.

7. Land Use

a. Land Use Characteristics

Under this alternative, lands now in grazing and zoned agriculture will essentially become open space. The ownership patterns of Federal, state, and private lands probably will not change in that the operational pressure to exchange lands will be less pervasive than at present. Other land uses for rights-of-way, utilities, etc., are expected to remain as described for the proposed action.

Subdivision activities may again increase although the available amounts of land now far exceed any projected demand. The absence of grazing will certainly prompt the ranchers to seek other uses, or buyers, of their private lands. However, what land use might occur is highly speculative and unpredictable.

Some ranches that have approximately 50% private land and available uncontrolled land, such as Canyon Ranch, Cedar Canyon, Clay Springs, and Hackberry, could continue grazing activities although on a reduced herd basis. The custodial allotments with small amounts of Federal land (Feldspar, Long Mountain, Peacock Mountain, and West Peacock) could also continue to operate. If land disposal occurred, the other four custodial allotments could also be operational.

b. Recreation

The elimination of livestock, the improvement in range condition, and the related enhancement of wildlife habitats will be strong stimuli for increased recreational use of the land. Sightseeing, camping, and rock-hounding will increase relative to the quality of the range and improvement in scenic and natural qualities. As there are no reliable data on which to base forecasts, this increase is not quantifiable.

It is noted that the extensive fencing proposed will restrict big game movement as noted in subsection 6 above. This fencing will also restrict public access, recreational use, and, along with BLM management policies, prevent unconstrained hunting activities. The bulk of the recreational use in the ES area will still be focused on the Colorado River and related lakes.

c. Agriculture and Forest Products

Land use in these two categories, particularly forest products, is not expected to change. There may be some speculation in agriculture; however, the ranchers historically are not prone to becoming farmers. Further, the capability of water resources to support large-scale farm operations is not known as current data are insufficient for such determination. The possibility exists but its realization is dependent on more detailed study, heavy front-end financial commitments, and a significant change in the ranch community's attitude toward farming. Further, the two most prevalent soils in the area, Anthony-Vinton-Agua (31.1%) and Cellar House-Mountain Rock (24.6%), have only a medium to low potential, respectively, for irrigated cropland.

d. Livestock Grazing

The elimination of livestock grazing on the public lands within the ES area will have a catastrophic impact on the local livestock industry as only one allotment (17A) of the 26 with AMPs controls more than 50% of the area it occupies. Eleven allotments* are composed of between 50% and 75% of public lands. The remaining 14 allotments** are made up of between 75% and 100% public grazing lands.

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*15A, 18A, 19A, 20A, 23A, 26A, 29A, 42A, 58A, 56A, and 70A.
**7A, 10A, 27A, 30A, 34A, 36A, 55A, 57A, 60A, 61A, 65A, 68A, 66A, and 71A.

The non-grazing alternative will have less impact upon the eight "custodial" allotments since five of these* have less than 14% public lands, while the other three** have between 36% and 53% public grazing lands.

The reduction of a prorated basis of AUMs as permitted on the Federal lands will be sufficient to eliminate a viable range livestock economy within the ES area. The elimination of 62,571 AUMs on Federal lands from the current allowable use of 91,484 will mean a reduction of 68.4% within the ES area.

e. Mineral Resources

The absence of grazing could readily stimulate capitalization on the potential for some ranchers to lease or sell their lands for mineral extraction. The Red Lake area (Cane Springs allotment) and perhaps protions of the Big Ranch allotment contain salt deposits that are most likely to be developed. The possibility of any increased mining activity, however, is dependent on factors outside the area and this alternative and occurrence are unpredictable.

f. Transportation

The elimination of grazing activities is not expected to alter the present use of land for transportation purposes.

8. Natural Hazards

With the resultant increase in vegetative cover under this alternative, the potential for floods and dust storms will be reduced although not eliminated. The valley areas in particular will benefit. Conversely, the fire hazard will increase although the fires are expected to be small in area and mostly set by humans in the vicinity of roads and urban development.

9. Cultural Resources

The elimination of livestock grazing on public lands will eliminate cattle damage to artifacts and other cultural data. Further, the construction of extensive fencing will restrict access, thus slightly reducing the vandalism potential. However, there will be continued damage on the private lands at about the same rate as at present. A significantly larger acreage of land will be disturbed by boundary fencing. Further, the fence lines will reflect legal boundaries and will be difficult or impossible to relocate to avoid cultural resources. Depending on the number of sites encountered, the costs to the BLM for scientific salvage could be considered substantial.

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*32C, 48C, 53C, 59C, and 74A.
**24C, 72C, and 77C.

10. Natural Environmental Areas

This alternative will in effect favor the natural areas having scenic, primitive, and wilderness values (see Table II-55) in that there will be a complete reduction in the cattle grazing and trampling pressures on these resources. This will be particularly beneficial to the Willow Springs and Mt. Nutt areas. Further, with the reduction in livestock/ wildlife competition, the crucial habitat areas will be enhanced.

11. Visual Resources

The construction of 4980 miles of boundary fences which follow ownership lines and not topographic features will have a noticeable visual impact both in the short and long term. The presence of this fencing will result in strong contrasts between the line, form, and color of the fence and the landscape. These contrasts will be most evident in the valley areas and will disturb the scenic quality by imposing a patchwork pattern on the sense of openness of the range. This checkerboard pattern is most prevalent in Cane Springs, Diamond Bar/Gold Ranch, Cedar Canyon, Mt. Tipton, Big Ranch, Hackberry, Black Mountain, and Ft. McEwen.

In time a general improvement of the vegetational cover within the area will modify and enhance the general texture of the landscape, particularly in grassland sites. Although there will be no vegetation manipulation and associated short-term adverse impacts, there will be an increased potential for wildfires and related stark contrasts of the burned areas.

12. Socioeconomic Conditions

a. Demographic Characteristics

The general characteristics and trends in Mohave County are not expected to be affected in any noticeable manner by this alternative.

b. Employment

Similarly, the employment patterns and projections are expected to occur as indicated under future trends. The growth in other sectors will continue regardless of the decline in or elimination of livestock grazing in the ES area.

c. Income

Total personal income will increase as projected and will only be marginally affected by a decline in livestock operations as the industry has only very weak ties to the county's economy.

d. Livestock Grazing Activities

(1) Ranch Characteristics. The total number of ranches in the area will probably decline as a result of this alternative as 5214 cyls will be removed from Federal lands. The three ephemeral allotments, as well as those with 15 or less cyls (Clay Springs, Crutain, Gediondia, Dolan Springs, Music Mountain, Stockton Hill, and Upper Music) are the most likely candidates to cease operations. The custodial allotments are more likely to remain operational, particularly if the land disposals were to occur. It is expected that the ranch community, however, will become more heavily dependent on outside sources of employment and income and be taken away from the ranch.

Essentially those ranches that remain will continue to operate as in the past. Their movements, however, will be restricted by the checkerboard pattern of ownership and fencing. The effect of this restriction and the difficulties in accessing pastures and maintaining improvements will probably further depress operations. In general, it can be assumed the rancher will be hard pressed to continue the ranching life-style. Rancher flexibility in grazing practices and opportunities to improve and manage livestock operations will also be reduced.

(2) Cattle Shipments, Market Characteristics, and Sales. The loss of some ranches and the difficulty of operating others will depress the Mohave County cattle market. Sales and shipments will decline in number until most marketing will be done through out-shipments. Cattle weights are assumed to remain stable as the use pastures are expected to be grazed at about the same levels as at present. Cattle prices will continue to be affected by factors outside the study area.

(3) Herd Inventory and Composition. The composition of the herds will remain as at present, but will decline in value to $621,000, as shown in Table VIII-8, or $1.3 million less than under future trends. There will be only 530 sale cattle valued at $95,100, as compared to 1677 cattle valued at $301,200 in the future trends.

(4) Ranch Value. Under this alternative there will be a dramatic reduction in the value of the 18 ranches from $7.47 million to $3.63 million. At this level the cattle herd will be valued at $621,000, land at $940,000, improvements at $1.61 million, and machinery at $460,000. The ranchers will realize a capital gain of $1.3 million from the sale of cattle.

(5) Economic Operation of the Ranch. The average size of the remaining ranches will be 105 cyls (see Table VIII-9). At this level the yearly return will be a loss of $490 which is less than the $2,700 loss expected under future trends. This situation, however, may be understated as the difficulties in operating these ranches with the checkerboard patterns, disrupted pastures, and inefficient location of existing water sources relative to these new patterns will all tend to limit grazing flexibility and increase costs to a difficult-to-measure level.

TABLE VIII-8

HERD COMPOSITION AND INVENTORY VALUE - ALTERNATIVE E, STOCKING RATE 2,409 CYLS

| Herd Composition | Cyl | Price per Pound | Weight (lbs) | Value |
|---|---|---|---|---|
| 50% Producing Cows | 1,205 | 22¢ | 1,000 | $265,100 |
| 20% Replacement Heifers | 482 | 37¢ | 600 | 107,000 |
| 5% Bulls | 120 | $400 each | | 48,000 |
| 3% Horses, Milk Cows | 72 | $300 each | | 21,600 |
| 11% Steers (sale type) | 265 | 40¢ | 520 | 55,100 |
| 8% Heifers (sale type) | 193 | 34¢ | 435 | 28,500 |
| 3% Cull Cows | 72 | 20¢ | 800 | 11,500 |
| Subtotal | 2,409[a] | | | $536,800 |
| 50% Heifers[b] | 319 | 40¢ | 300 | 38,300 |
| 50% Steers[b] | 319 | 48¢ | 300 | 45,900 |
| Subtotal | 638 | | | $ 84,200 |
| Total | 3,407 | | | $621,000 |

a. Cyls remaining on private and state-controlled lands.
b. Calves one day old to yearlings based on 65% calf crop for producing cows and replacement heifers less sale-type steers and heifers.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

TABLE VIII-9

AVERAGE RANCH EXPENSES AND RECEIPTS - ALTERNATIVE E, STOCKING RATE 2,409 CYLS

| Expense Item | Percent of Total O&M Budget | O&M Costs* |
|---|---|---|
| Overhead | 23.2% | $ 2,440 |
| Labor | 15.3 | 1,610 |
| Machinery | 20.5 | 2,150 |
| Material | 12.3 | 1,290 |
| Custom Services | 1.5 | 160 |
| Interest | 9.0 | 950 |
| Depreciation | 18.2 | 1,900 |
| Total | 100.0% | $10,500 |

| Herd Composition | 65% Calf Crop |
|---|---|
| Cows | 89 |
| Replacement Heifers | 11 |
| Bulls | 5 |
| Market Steers | 29 |
| Market Heifers | 18 |
| Cull Cows | 9 |

| Receipts | Weight (lbs) | Price per Pound | Number of Head | Total Price |
|---|---|---|---|---|
| Cows (cull) | 800 | 20¢ | 89 | $ 1,420 |
| Bulls (cull) | 1,100 | 30¢ | 1 | 330 |
| Heifers | 435 | 40¢ | 18 | 3,130 |
| Steers | 520 | 34¢ | 29 | 5,130 |
| Total Receipts | | | | $10,010 |
| Total Ranch O&M | | | | $10,500 |
| Profit (Loss) | | | | $ (490) |

*105 cyls with $100/cow unit O&M cost.

Sources: Arthur D. Little, Inc., estimates; American Ag International estimates; Arizona Crop and Livestock Reporting Service; Arizona Agricultural Statistics.

(6) <u>Indirect Economic Effects of Ranching</u>. The effect of this alternative will be to eliminate 26 jobs in employment directly related to ranching and 34 jobs totally relative to future trends. There will also be a related net loss of total income of $172,300.

e. Government Revenues

The construction of 4980 miles of boundary fence to separate private and state lands from BLM lands will generate some short-term construction employment and some future maintenance employment. Construction of 4980 miles of Type A and Type D fence at $2,500 per mile will equate to an expenditure of $12,450,000 by the BLM. With an annual maintenance charge of 3% of construction cost, annual fence maintenance will cost the BLM $373,500.

The BLM will still have a need for range supervision, management, and personnel to care for the public lands. Expenses for these resources will approximate present costs.

The BLM will also lose annual revenues of $94,500. Similarly, the state's fees will be about $2,000-3,000.

The assessed valuation of the remaining private ranch lands will be approximately $650,000. County tax revenues will therefore decrease by $55,400 to $52,200.

f. Support Facilities and Services

Public services will continue to be provided throughout the county regardless of the implementation of this alternative. The rancher may make some additional use of some of these services because of the decline in ranch operations. Given the past history of the rancher's strong reservation toward use of such facilities, however, it is difficult to project such use with any assurance.

g. Social Well-being

This alternative will generate the most significant adverse impacts upon the social well-being of the ranch community. Not only will their means of livelihood be removed, but also their entire life-style will be threatened. Considerable resentment and opposition can be expected from the livestock operators in the form of personal and political expression and pressure. Local public opposition will be equally strong since removal will conflict with strongly held local values and attitudes regarding the virtues of ranching, local control of public and private lands, and self-determination.

13. Institutional

While this alternative will preclude the need for additional BLM personnel, a loss in grazing fees, and the expenditure of funds for range improvements, a BLM presence will still be required. The focus of the BLM

will change from a traditional role geared to rangeland management to one of wildlife management and recreation, open space, and environmental resource management. This will require some adjustments in job descriptions and possibly some reduction in staff.

The BLM's relationship with other government agencies will also change. Agreements with the NPS on LMNRA lands will be canceled but linkages with the FWS will be strengthened as the stress will be on the animal and vegetative rather than livestock environments. The total removal of the herds from public lands and their partial or total removal from private and other lands will pose a threat of revenue loss to the state, which will probably oppose livestock removal.

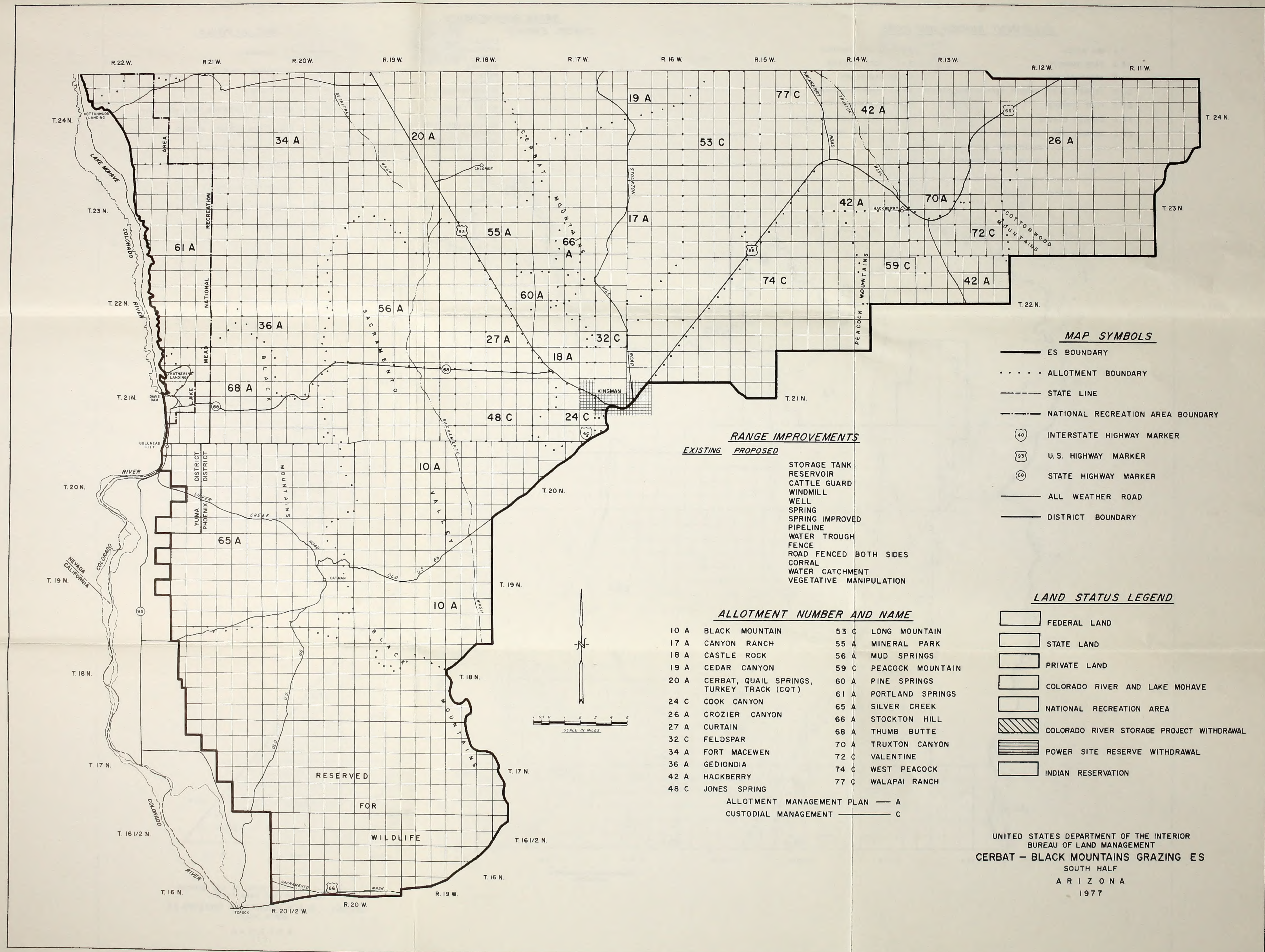
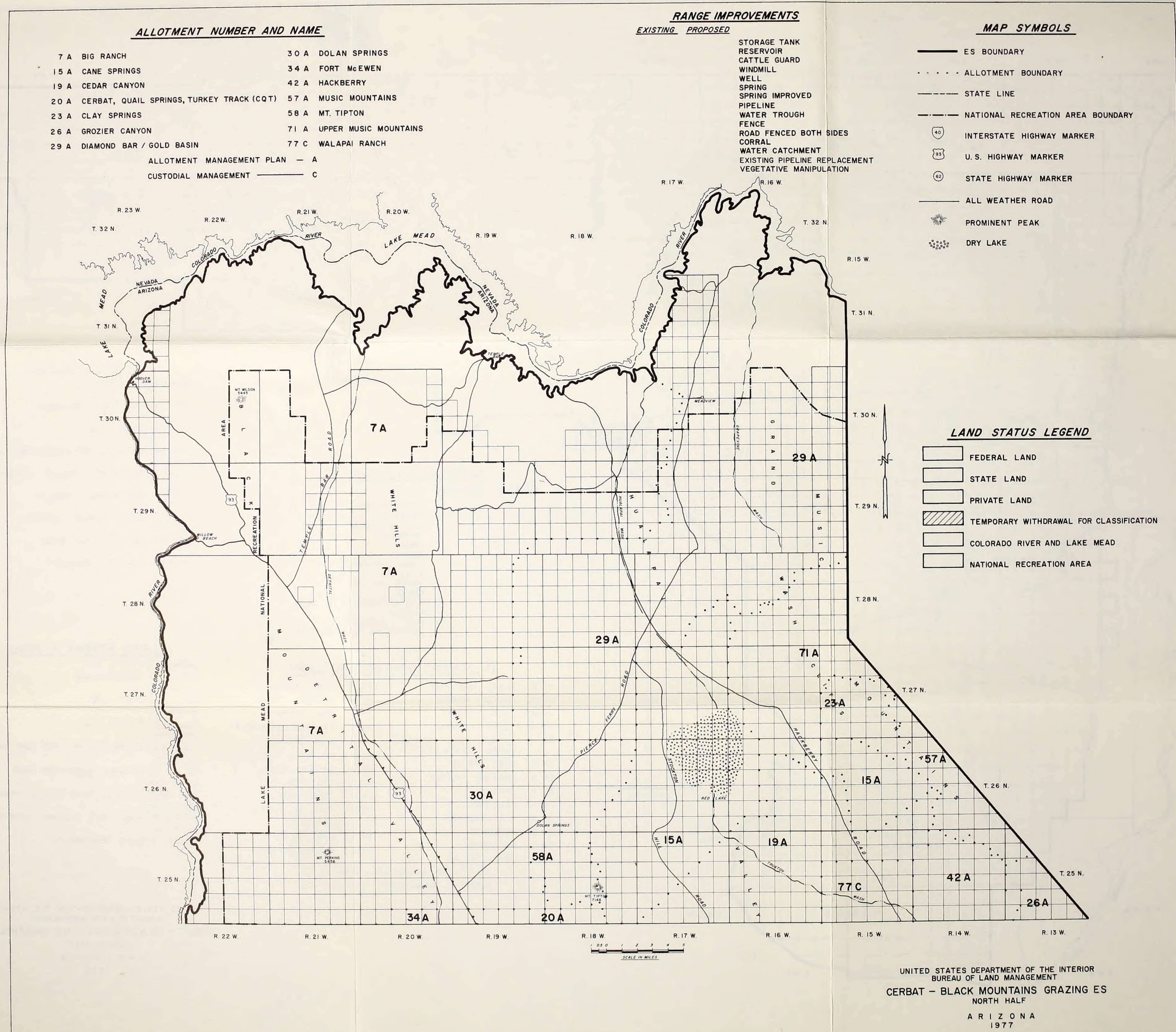



FIGURE I-2 EXISTING ALLOTMENT BOUNDARIES – ES STUDY AREA

ALLOTMENTS, NUMBER AND NAME – SOUTH HALF




ALLOTMENTS, NUMBER & NAME — NORTH HALF

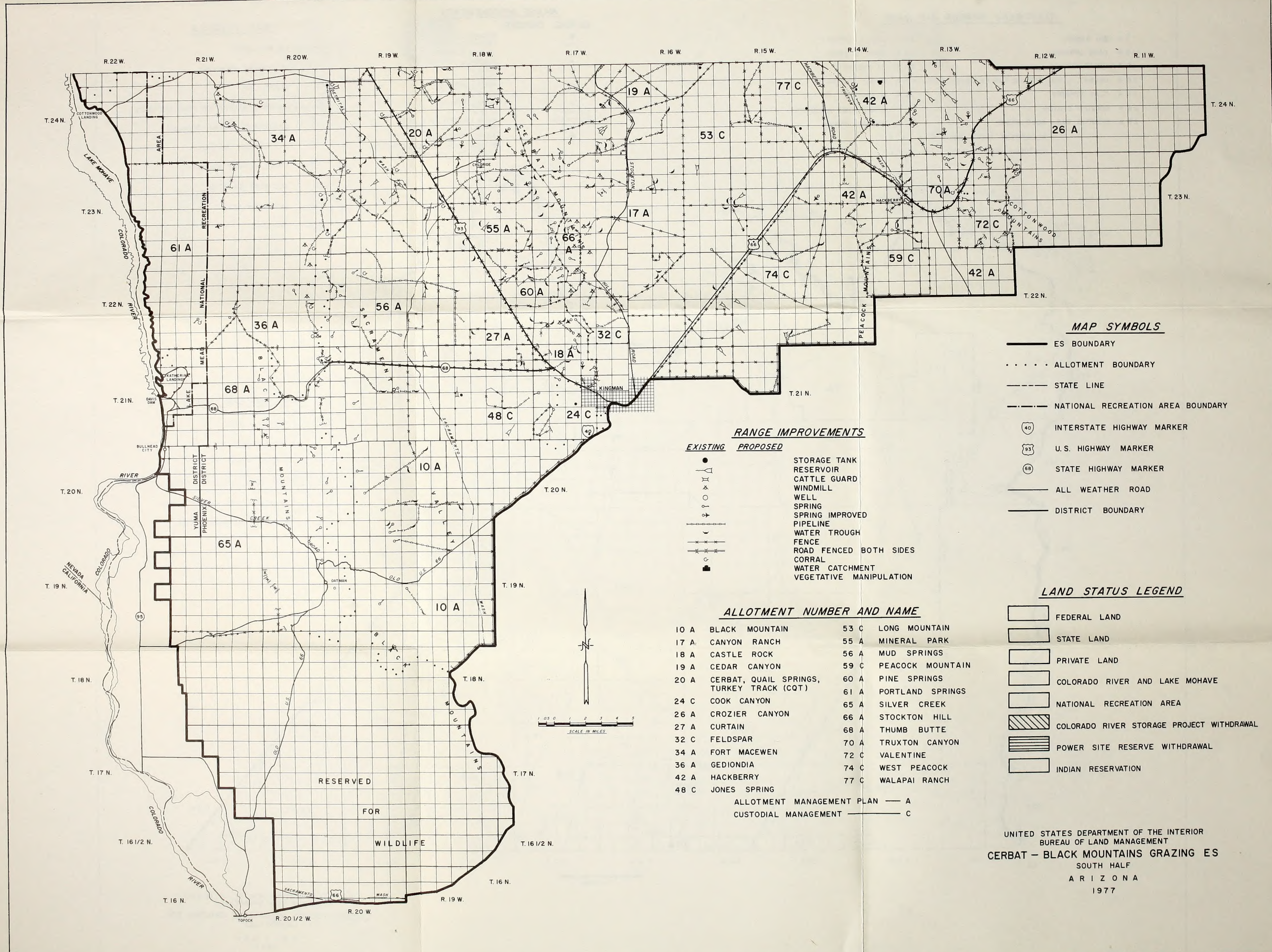
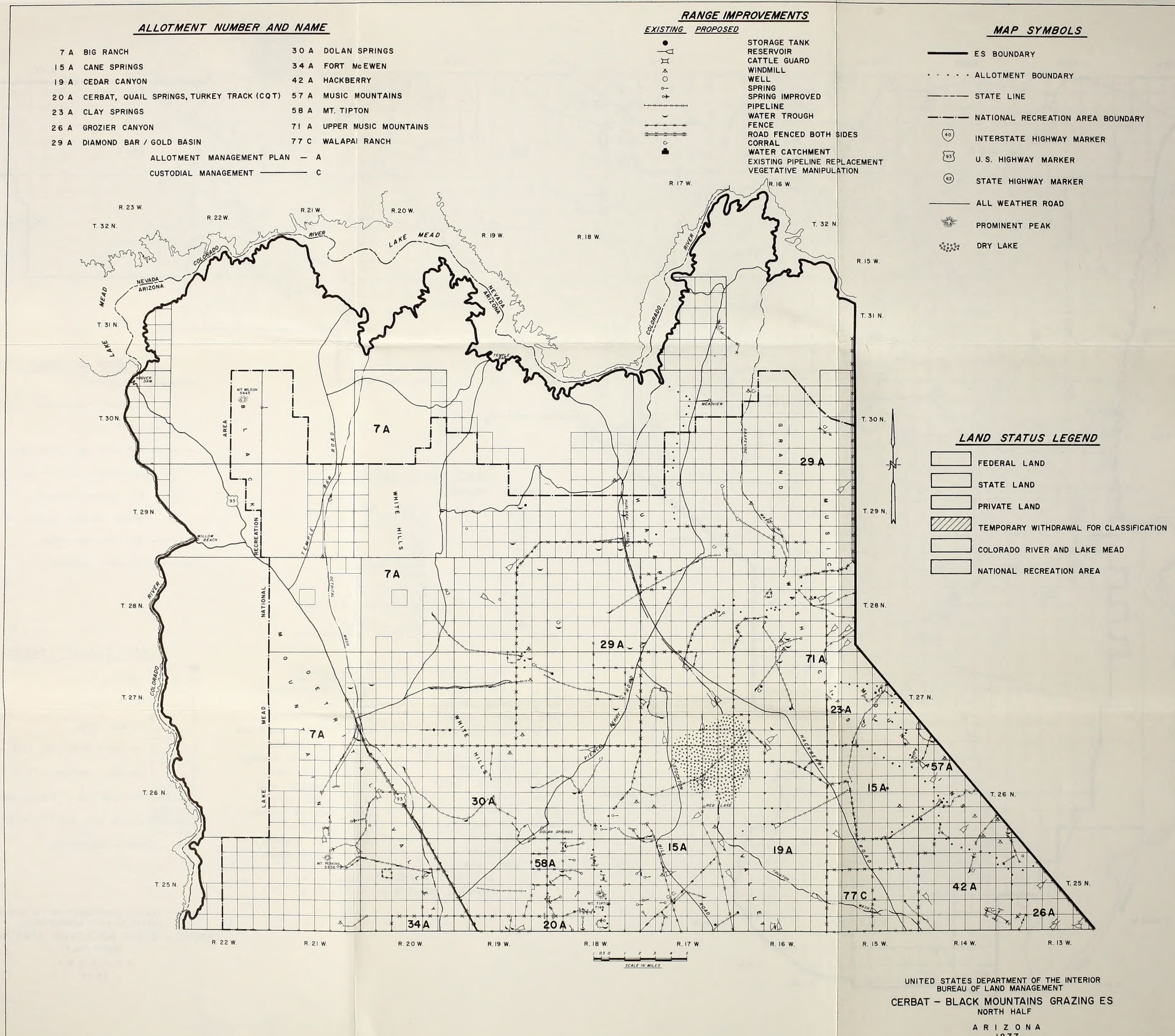



FIGURE I-3 EXISTING IMPROVEMENTS, ALL ALLOTMENTS



EXISTING IMPROVEMENTS – NORTH HALF

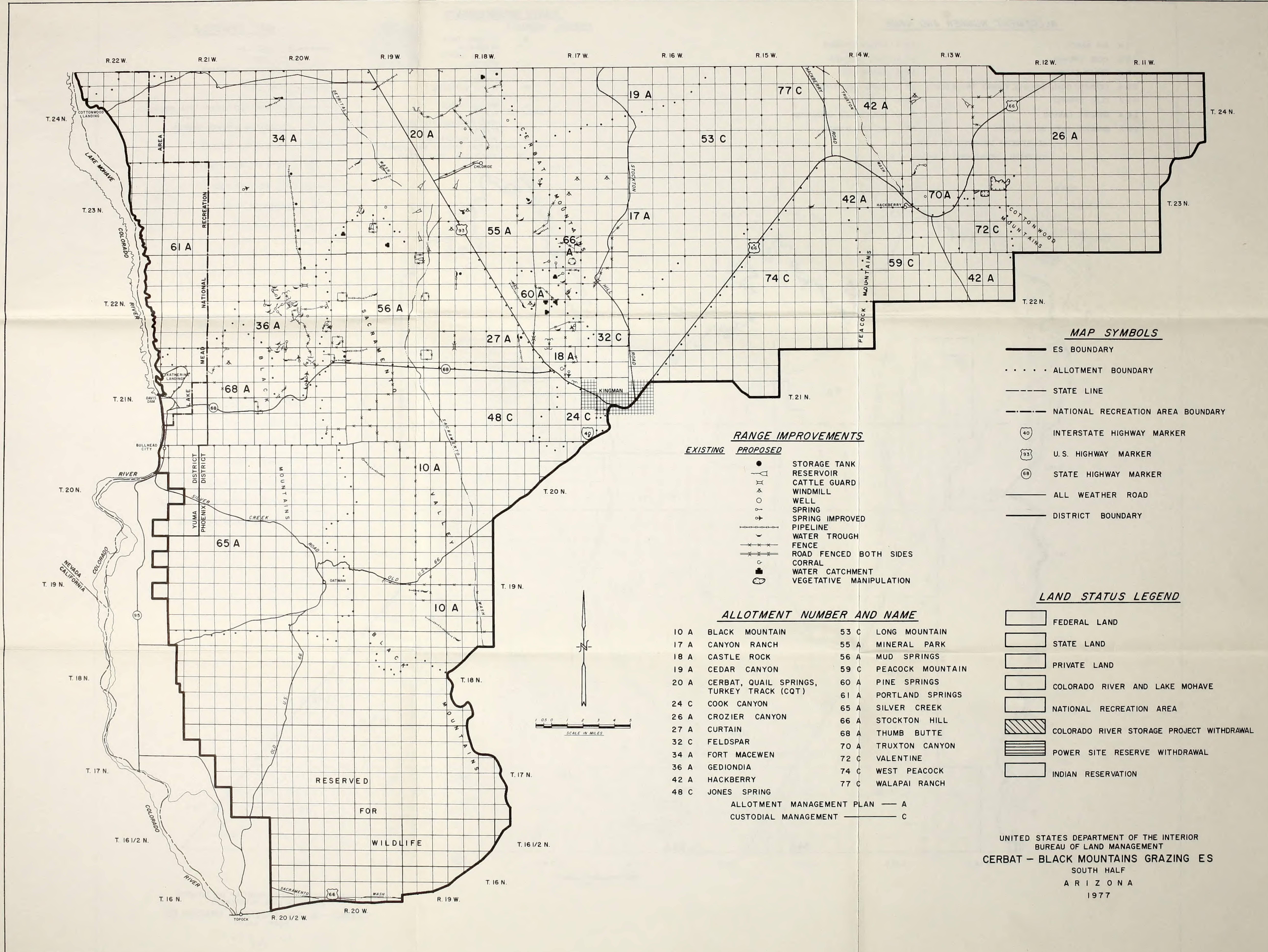
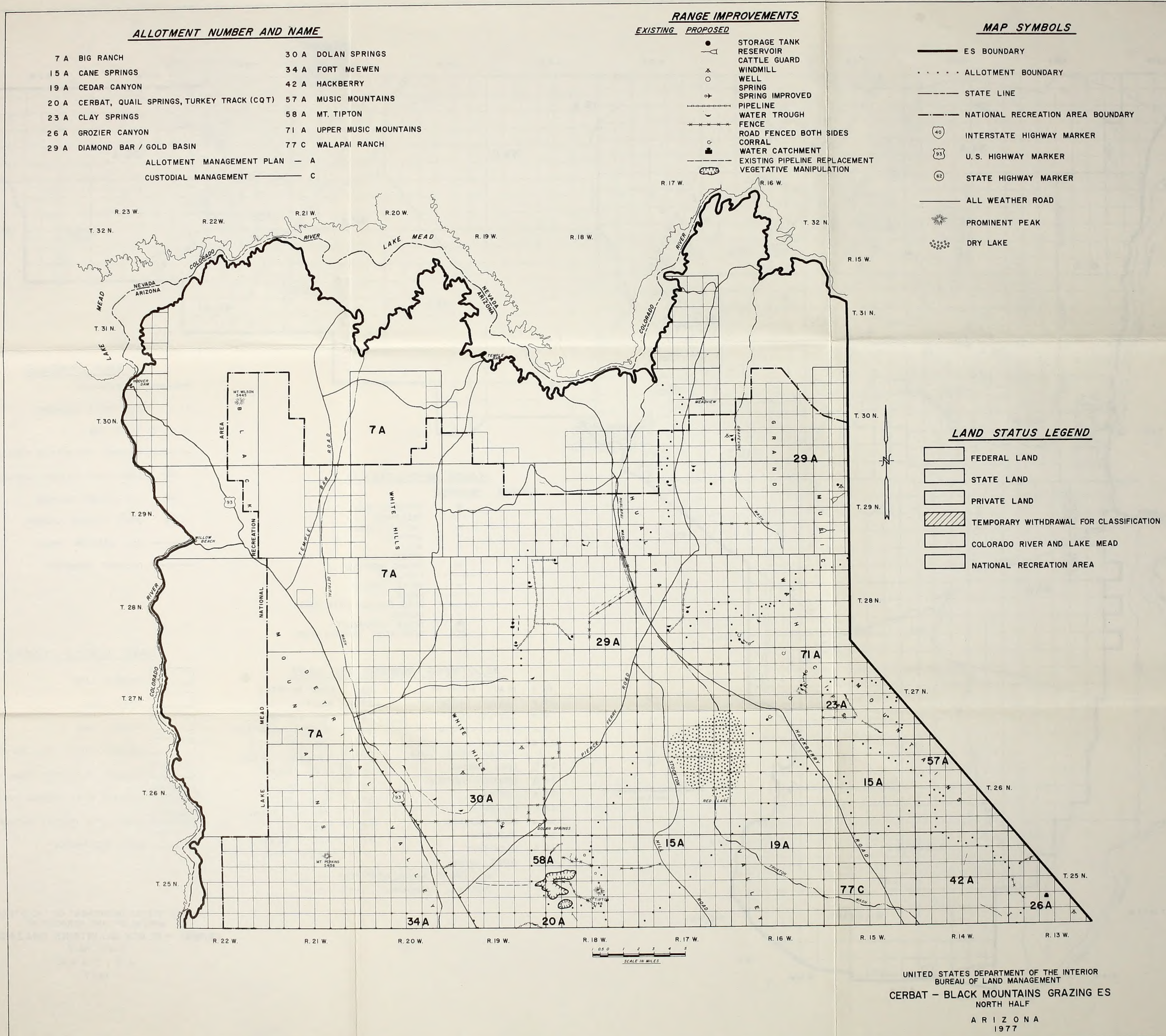



FIGURE I-4 PROPOSED IMPROVEMENTS, ALL ALLOTMENTS

PROPOSED IMPROVEMENTS – SOUTH HALF

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BUREAU OF LAND MANAGEMENT

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NORTH HALF

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PROPOSED IMPROVEMENTS – NORTH HALF

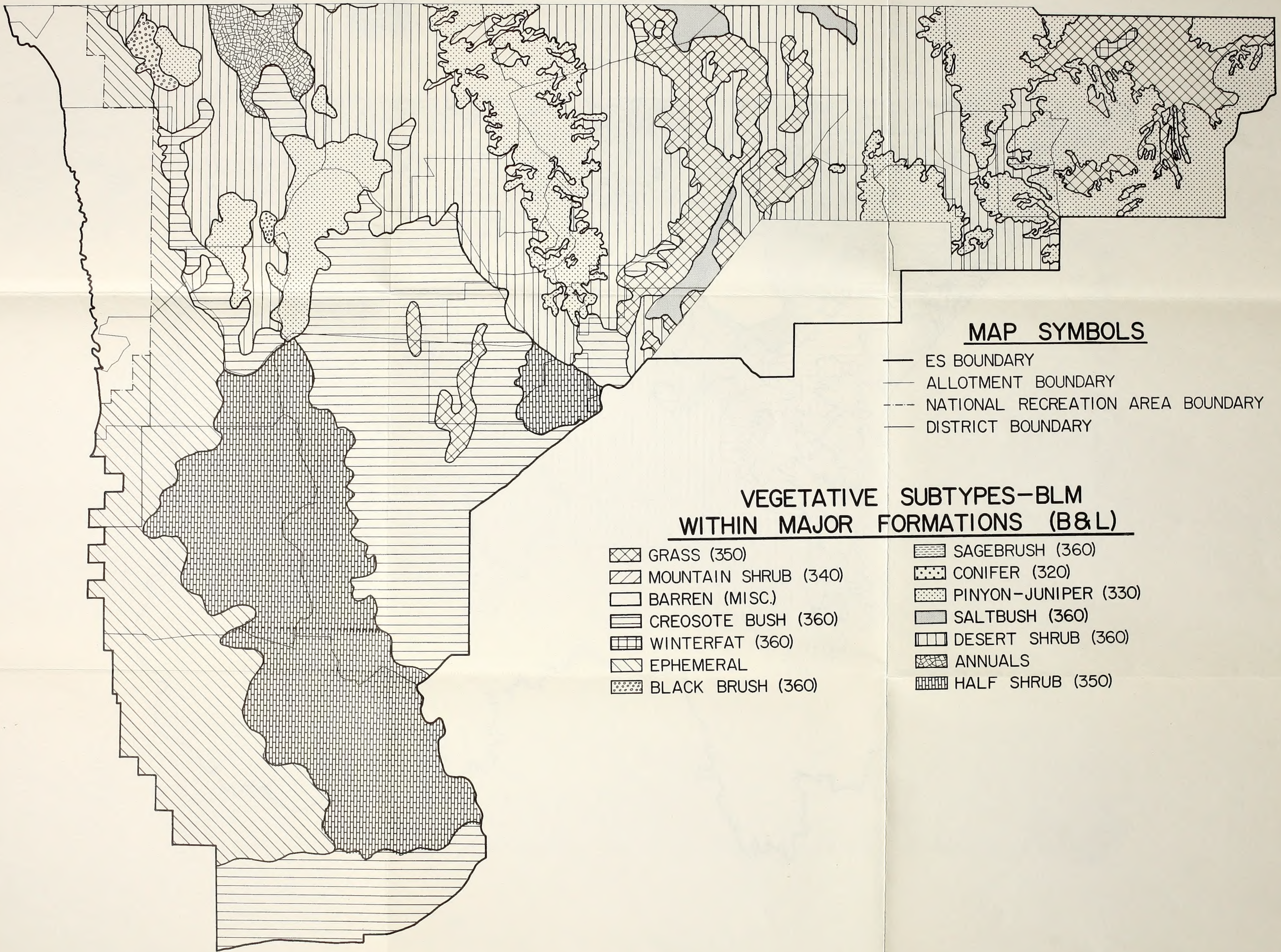
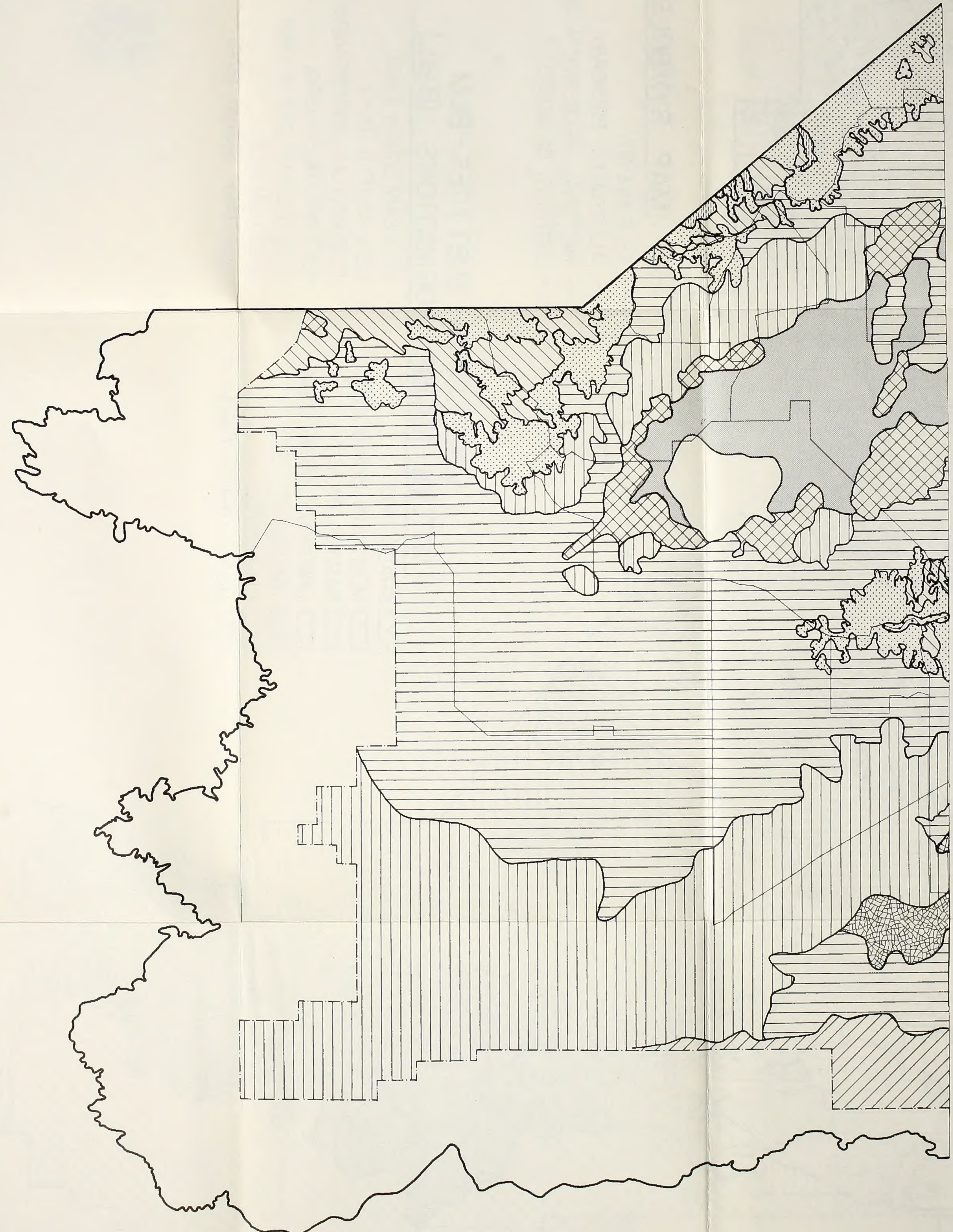



FIGURE II-16 DISTRIBUTION OF VEGETATIVE SUBTYPES – ES STUDY AREA



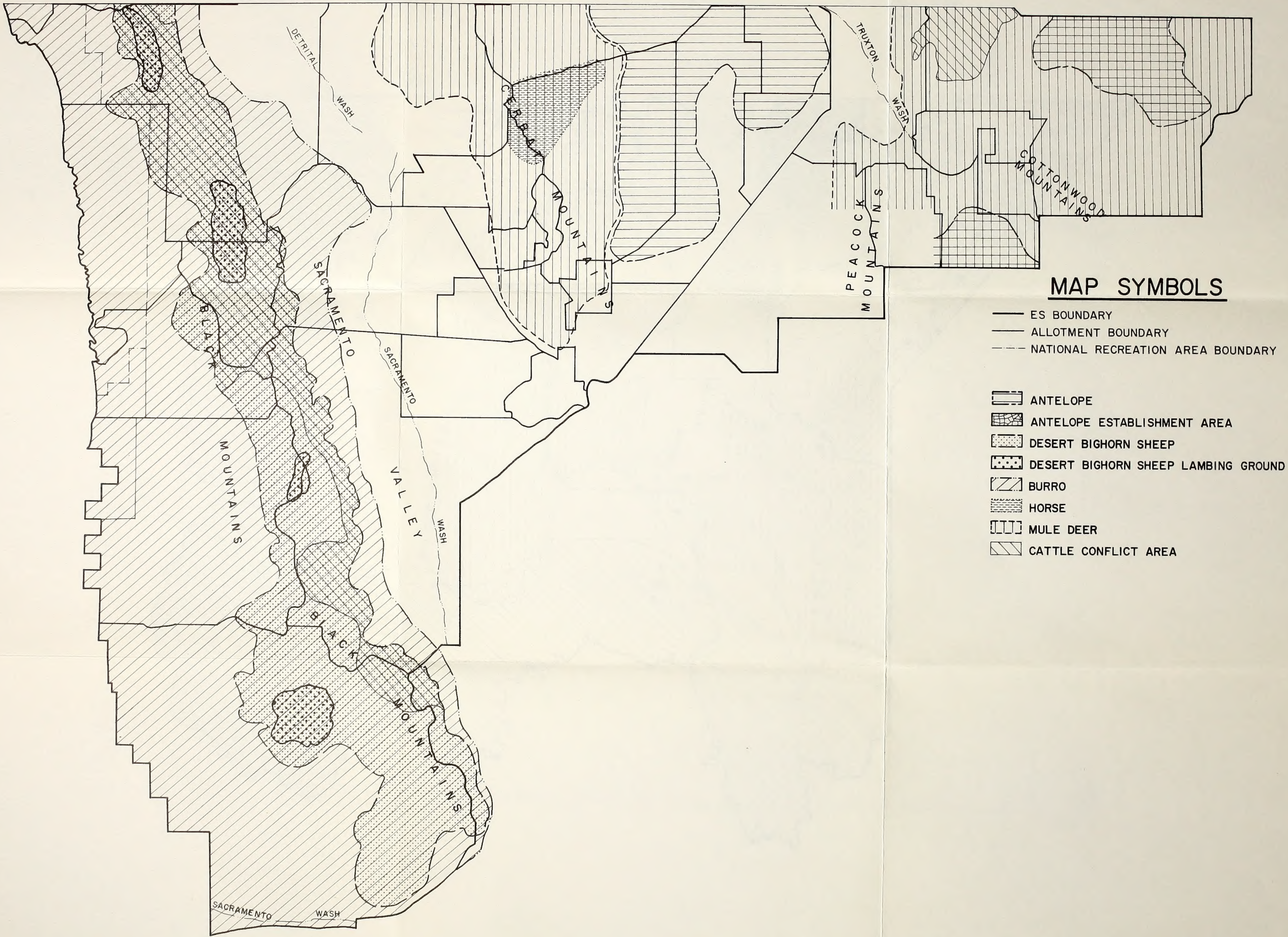
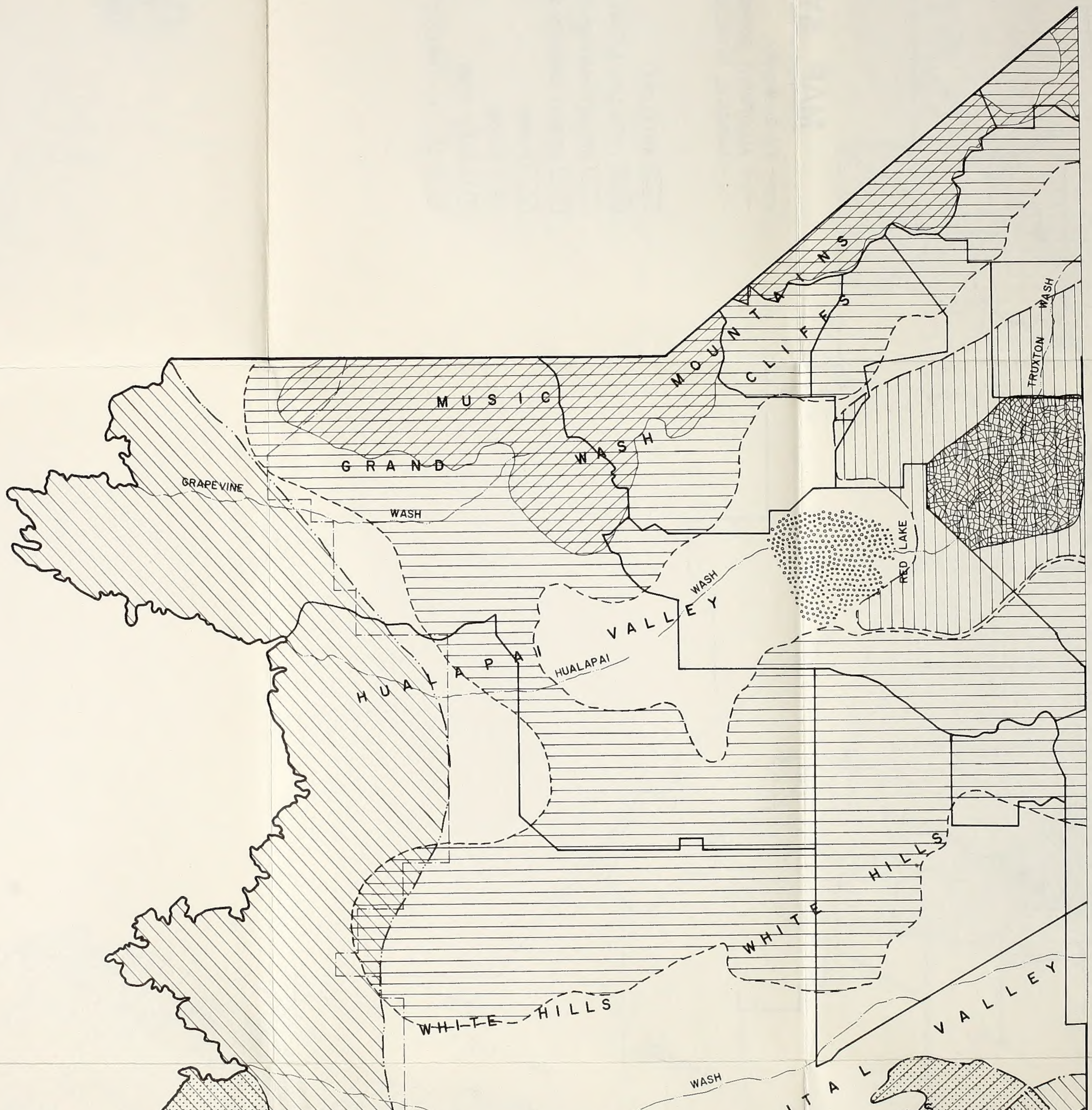



FIGURE II-18 DISTRIBUTION OF ANIMAL HABITATS – ES STUDY AREA


MUSIC
GRAND
GRAND WASH
WASH
CLIFFS
MOUNTAINS
GRAPEVINE
WASH
TRUXTON
WASH
RED LAKE
WASH
VALLEY
HUALAPAI
HUALAPAI
WHITE
HILLS
WHITE HILLS
DETRITAL
WASH
DETRITAL
VALLEY
BLACK
MOUNTAINS

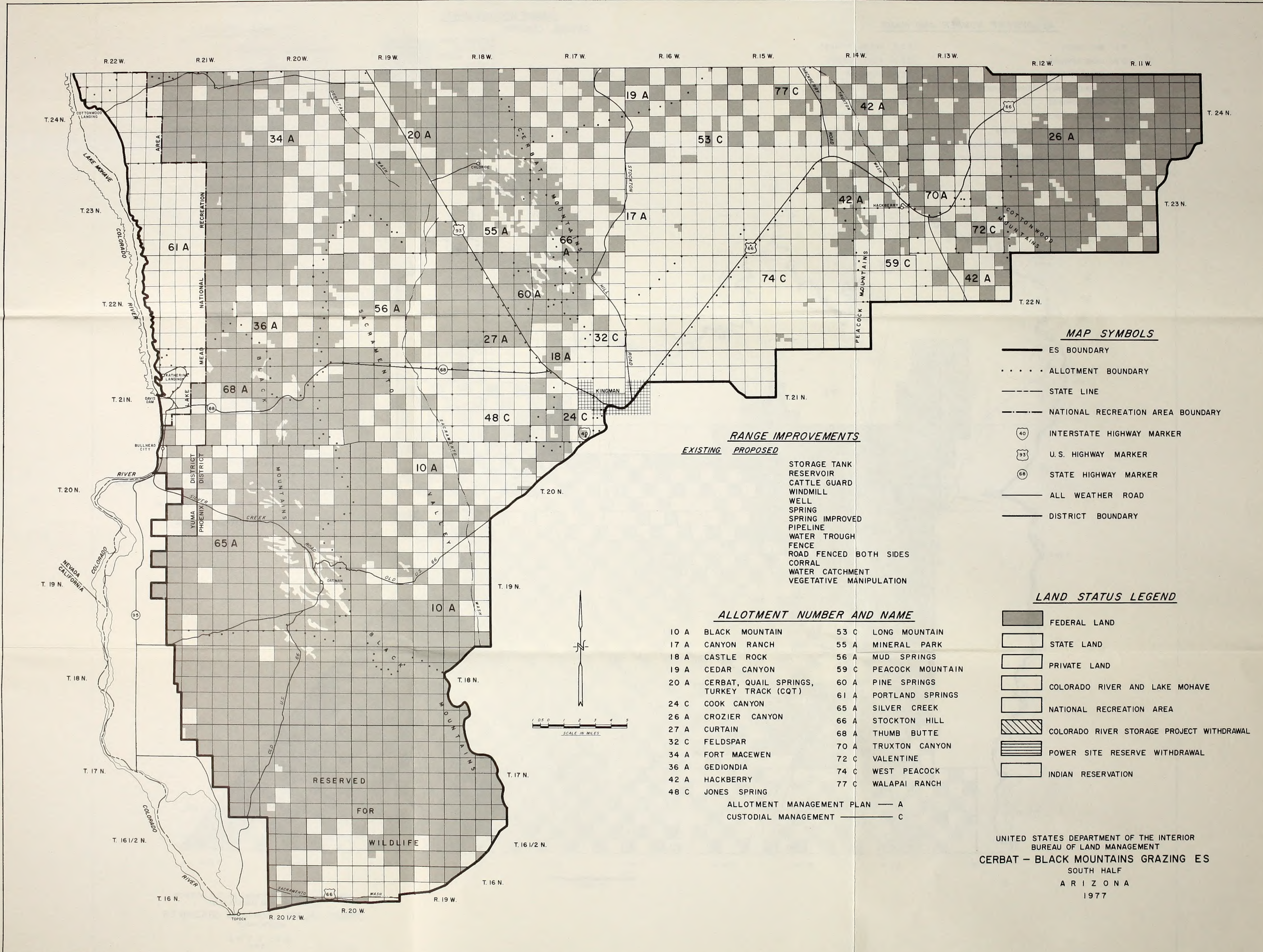
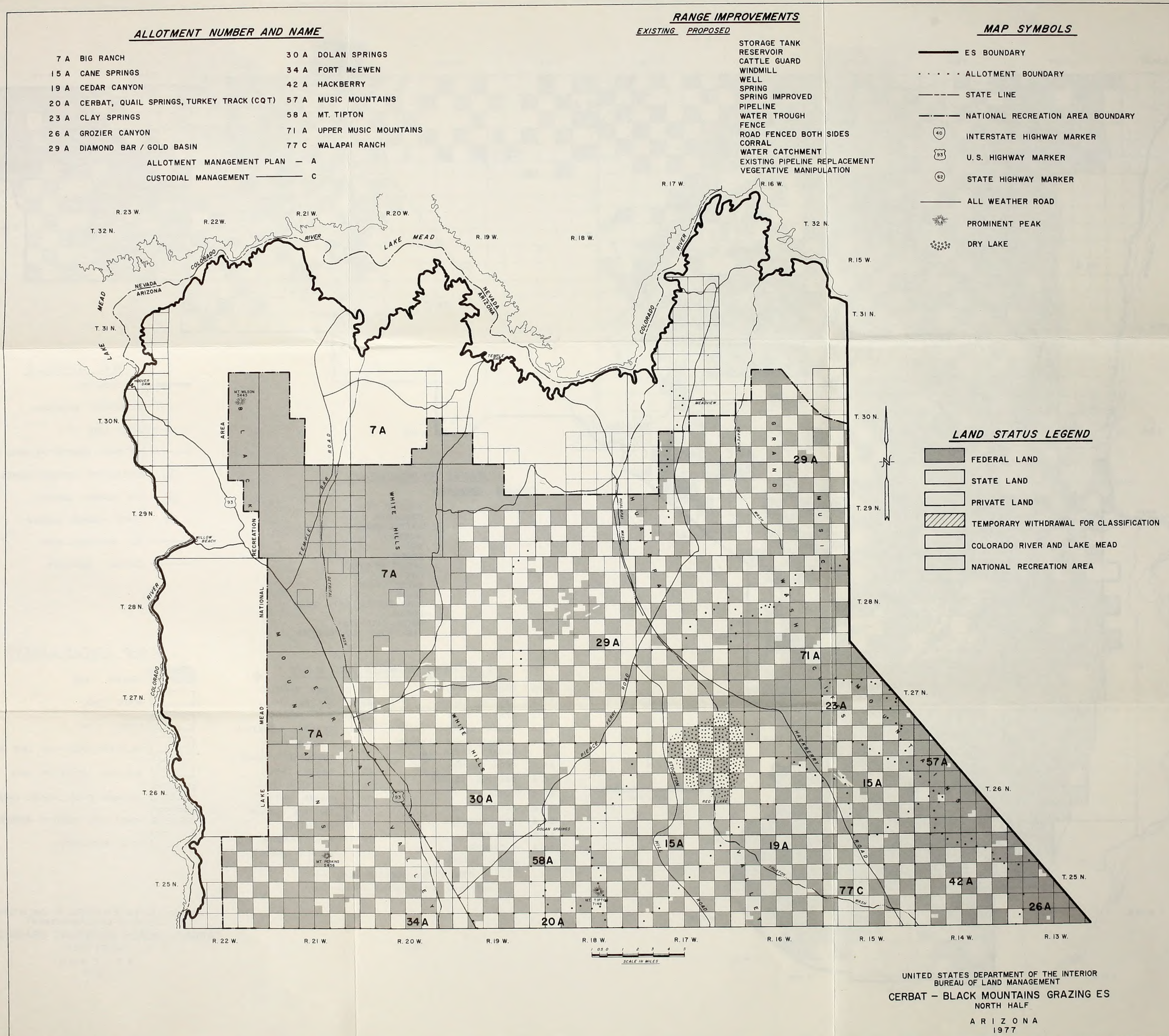



FIGURE II-19 FEDERAL LAND OWNERSHIP PATTERN

FEDERAL LAND—SOUTH HALF




FEDERAL LAND — NORTH HALF